# A MANAGEMENT SURVEY BY THE NAVAL OFFICERS IN THE MANAGEMENT ENGINEERING PROGRAM

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# A MANAGEMENT SURVEY

by

The NAVAL OFFICERS in the MANAGEMENT ENGINEERING PROGRAM

A Group Thesis Submitted to the Faculty
of the Department of Management Engineering
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE

Major Subject: SCINTILLA DIVISION
BENDIX AVIATION CORP.
SIDNEY, NEW YORK

Rensselaer Polytechnic Institute
Troy, New York

June 1957

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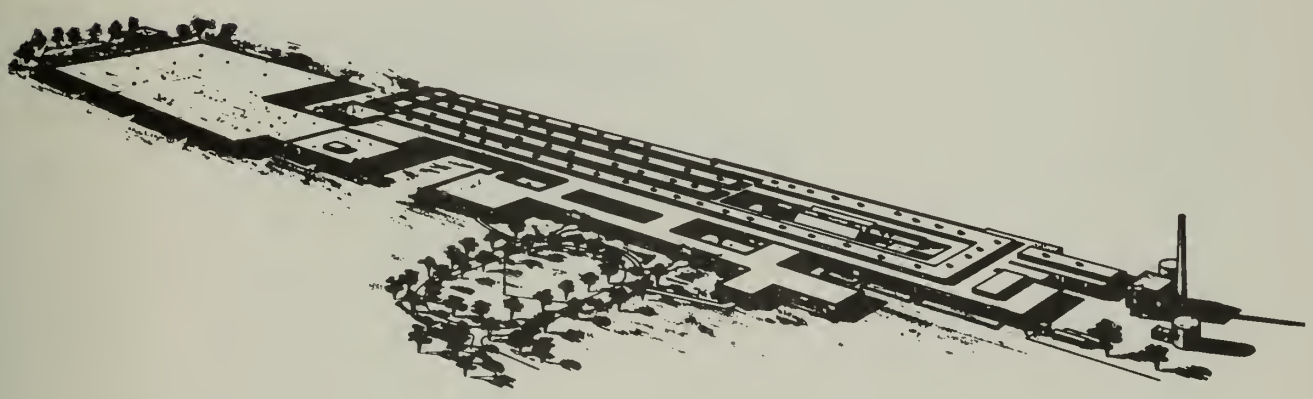
# Management Survey

of

SCINTILLA DIVISION
BENDIX AVIATION CORPORATION
SIDNEY, NEW YORK

*1957*



**SCINTILLA DIVISION**
**Bendix Aviation Corporation**
**Sidney, New York**

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# FOREWORD

## Purpose

This management survey provides the opportunity for the officers to apply the theoretical and practical concepts and philosophies to an existing and successful industrial concern. It is inevitable that the past experiences and specializations of the officers will be superimposed on their recent scholastic development in their respective survey areas. Major effort has been directed towards molding these concepts into a combined, practicable, and objective approach to the survey. Arrangements for the study were made by the Department of Management Engineering, Rensselaer Polytechnic Institute.

## Scope

For study purposes, the Scintilla Division was divided into eleven major areas. Recognizing the fact that only a limited amount of actual time was available in the plant for observation, data collection, and consultation, considerable effort was devoted to collecting the maximum practicable amount of useful data in a minimum of time. This approach was considered mandatory in view of the limited number of trips to the plant due to the distance involved.

It is considered pertinent to emphasize at this point that in many cases, the detail reasons for performing functions in a certain manner remain unknown to this group. The mere presence of these reasons plus the various personnel and personality factors pose additional considerations that must be superimposed and recognized when studying the recommendations. Only after carefully applying these additional factors would it be possible to determine the relative merit of the recommendations, since such action might temper their feasibility of acceptance with a resultant change in the phasing of implementation.

While it is recognized that additional factors could be brought to bear on each recommendation through additional study, it is pointed out that each known factor has received careful study with due weight being given to the available data. The opinions and recommendations are submitted in a manner intended to be constructive and thoroughly considered, yet frank, in order to derive the optimum in usefulness.

ACKNOWLEDGMENT

The student Naval officers wish to express their sincere appreciation for the opportunity to conduct this management survey. We are indeed grateful for the consultation and advisory meetings provided us as individuals and as a group by the Head of the Department of Management Engineering and his staff. It is recognized that the degree of success realized in a program of this nature rests to a major extent with the concern under study. The officers of this group, therefore, wish to thank the entire Scintilla Division of the Bendix Aviation Corporation for their cordial and cooperative attitude during the performance of the study. Particular thanks are extended to Mr. G. E. Steiner, General Manager; Mr. D. S. Jones, Director of Industrial Relations; and Mr. C. Kuebler, Factory Manager for their most able assistance. Only through the combined and cooperative efforts of the Rensselaer Polytechnic Institute Management Engineering Department staff and the personnel of the Scintilla Division has this survey been possible.

Appreciation is also expressed to Mrs. Leo Hayes for the very competent manner in which she has typed this report.

# HISTORY

Switzerland was urged into the magneto-ignition business by the Allied Nations during World War I. Battery ignition was too new to be relied on, hence, all trucks, tanks, staff cars, and airplanes were fired by magnetos. Unfortunately, the best magnetos came from Germany. Caught short, the Allies appealed to Brown, Boveri, Ltd., a Swiss electrical firm who subsequently created the Scintilla Magneto Company at Soloure, Switzerland. Up to this time, magnetos had been built with a coil and a breaker assembly whirling inside fixed magnets. Since breakdowns were common, the Swiss decided to reverse the procedure. The fragil wire-wound coils no longer moved; it was the sturdy magnets which did the spinning.

Scintilla magnetos, prized in Europe, were unknown here until long after the Armistice, when Laurence R. Wilder collared the American agency. An office and shop were opened in Manhattan. This organization became known as the Scintilla Magneto Co., Inc., on May 17, 1921, and was a combination of Wilder Electric Trust; American Brown, Boveri; and Scintilla Magneto, United States branch. Their primary source of business was servicing magnetos since times were too early for aviation orders.

In the summer of 1925 the Scintilla Magneto Company moved to Sidney, New York. At that time the entire payroll consisted of the following: Laurence R. Wilder, President; Walter Spengler, Chief Engineer (of Swiss decent and current Director of Engineering); Thomas Fagan, Vice President & Sales Manager (of Irish decent and current Director of Sales, Service and Advertising); and nine employees. At first the magnetos were imported from Switzerland and altered to fit American engines. By December the payroll had grown to fifty-seven, fifteen of these being Swiss. Previously on December 14, 1924, Mr. George E. Steiner had joined Scintilla in New York, but it was on October 25, 1925, that he moved to the Sidney plant. Little did Mr. Steiner know that it was to be his fortune to progress with the company, eventually becoming the General Manager of the present organization.

By February 1926 the first ten "all-American" magnetos had been made. Later, Mr. Fagan pierced the Aviation Market by selling six units to the Wright Aeronautical Corporation. Soon to follow was the introduction of the United

States Navy to Scintilla. Eugene E. Wilson, a Naval officer in the Bureau of Aeronautics was introduced to Mr. Fagan and in the days that followed, firm contracts were awarded. But the Navy made one condition; the Scintilla agency must loosen its ties with Switzerland, taper off the imports and go into manufacturing for itself. An American source of magnetos had to be assured.

A year later, in the spring of 1927, Scintilla magnetos sparked the engines of the Spirit of St. Louis when Charles A. Lindberg flew non-stop to Paris. This spectacular flight so impressed the aeronautical industry that three engine companies -- Pratt and Whitney, Wright and Curtiss -- ensured their supply of magnetos by financing Scintilla's expansion.

The Bendix Aviation Corporation bought Scintilla, lock, stock and Swiss know-how in July 1929 and the company became known as the Scintilla Division. Its employment has expanded from the original nine to a present total of 4,700 and a current annual payroll in excess of twenty million dollars. From their original production of a single product in 1925 Scintilla has grown to a position where today it supplies equipment and services to aviation, automotive, and many other specialized fields. Their current major products are as follows:

Aviation

1. Low and high tension ignition systems for piston, turbo-jet engines and rocket motors.
2. Igniter plugs for jet and turbine engines.
3. Ignition analyzers.
4. Radio shielding harnesses.
5. Radio noise filters.
6. Switches.
7. Booster coils.
8. Electrical connectors.

Automotive

1. Magnetos.
2. Battery ignition units.
3. Bus-k-nect.
4. Switches.
5. Electrical connectors.

General

1. Crankshaft magnetos for small engines.
2. Base and flange mounted magnetos for one cylinder engines.
3. Magnetos for medium and large engines.
4. Low tension magnetos.
5. Diesel fuel equipment.
6. Diesel fuel injection equipment.
7. Ceramics.
8. Electrical connectors.

One momento has been saved from the early days, a sign painted to edify an old yet current company philosophy:

WORK WITH THE GREATEST CARE. BE SURE YOU'RE RIGHT. GIVE YOUR BEST. AIRCRAFT PILOTS ARE DEPENDING ON YOU FOR THEIR SAFETY.

## SUMMARY OF MAJOR RECOMMENDATIONS

It is considered that there are many advantages in bringing together a sample of the major recommendations in one location. It is hoped that this procedure will not lead the reader to believe that the detailed list of recommendations contained at the end of all chapters is less important. Data concerning the following recommendations may be found in their respective chapters.

### Organization

1. Reduce the span of control of the General Manager.
2. Establish a new activity in the Manufacturing Department titled Production Scheduling.
3. Establish a new department titled Planning.
4. Reorganize the Service Department.
5. Publish an official Division document defining and setting forth procedures for the establishment of recognized committees.
6. Prepare and maintain an up-to-date organization manual.

### Industrial Relations

7. Institute a formal merit rating system.

### Plant Protection

8. Transfer the functions of this department to the Industrial Relations Department.

### Plant Property

9. Transfer the functions of this department to the Plant Engineering Section.

## Office Procedures

10. Standardize office procedures.

11. Develop a "Stenographers' Handbook".

12. Establish the position of Office Manager.

## Accounting

13. Reorganize the Accounting Department.

14. Adopt machine accounting techniques in the General Accounting Section, particularly the Accounts Receivable and Accounts Payable areas.

15. Establish standards for indirect labor as a means of tightening control over indirect costs.

## Traffic

16. Relocate the Traffic Department within the Manufacturing Department.

## Engineering

17. Accomplish organizational changes to allow increased effectiveness of job progressing and control, activity co-ordination and standardization, and to lessen the presently wide span of management control by top engineering executives.

## Sales, Service, and Advertising

18. Improve co-ordination between the Service and the Engineering Departments relative to new design.

19. Integrate the Trade Sales Section of the Service Department with the Sales Department.

20. Improve the central scheduling function in the Manufacturing Department so as to provide Sales with more realistic information relative to the progress of orders.

21. Re-evaluate the potential existing relative to the Diesel Fuel Injection Line.

## Quality Control

22. That the Manufacturing Department be held rigidly and primarily responsible for scrap and rework.

23. That floor inspection be made effective in its present form or by adoption of a crib-type in-process inspection procedure; or that it be completely eliminated.

24. That standards of performance for bench inspectors be established and a procedure set up for reporting comparison of actual versus standard performance.

25. That a Methods Engineering Section be either established on or at least function in the Inspection Section of the Quality Control Department.

## Manufacturing

26. Modify existing organizational structure as outlined in Section 11.3, the primary consideration being the establishment of a Planning Department and the definition of clear lines of authority and responsibility.

27. Develop a manufacturing classification system combined if possible with a product classification, that would achieve consistent identity of manufacturing similarity characteristics.

28. Achieve manufacturing standardization insofar as possible, in conjunction with product standardization, by isolating and emphasizing the similarities disclosed by the classification system in order to achieve the most economic production.

29. Develop production-line techniques, and/or continuous flow production on certain product-groups, where the necessary volume can or might be obtained by:
    (1) Segregation of high volume production from low volume; that is, discard the present production procedures of complete product mix.

(2) Critical appraisal of quality concepts, tolerances, and other specifications that now limit continuous flow production.
(3) Combining auto-mated machines into single producing units.
(4) Increase in use of transfer mechanisms and other material handling devices to eliminate hand methods.
(5) Grouping into continuous flow operations all those standardized manufacturing sequences involving balanced operations, particularly where time required is equal, or nearly so, to the time available in annual or otherwise acceptable periods over individual or grouped productive units.

30. Adopt a centralized scheduling, decentralized dispatching, and continuous progressing system, using standard times and other production standards as a base, and utilizing the optimum sequence on the basis of the classification system.

31. Determine optimum inventory levels.

32. Institute a vigorous cost reduction program, including detailed cost analysis, a refresher training course, and an analysis group separate from accounting familiar with operations.

33. Increase the emphasis on methods engineering, primarily as concerned with operators and work place layout as contrasted to present emphasis on machine operations.

34. Establish a procedure for continuing appraisal of conditions and future activity as related to economic optimization studies on tools, capital expenditures, forecast requirements, inventory levels, use of facilities, etc.

35. Extend the coverage of production standards to as many areas of indirect labor as economically feasible.

36. Consider the possible application of work sampling as an aid in setting production standards.

37. Conduct a comprehensive study of the effect of the present incentive wage plan on production and productive capacity. This study should analyze and compare the present incentive system with the possible advantages of measured day work including an incentive bonus for acceptable cost reduction recommendations.

38. Issue a statement of policy from the General Manager that no employee will suffer a loss of wages as the result of the methods improvement and cost reduction programs. Further, discontinue the weekly report of personnel earning in excess of 150% on any job.

39. Expand the manufacturing layout to include a standard operation instruction sheet showing work place layout, the "What" and the "How". Further, institute procedures for ensuring that layouts, prints, etc., are current and correct.

40. Develop procedures for forecasting loads and load requirements, and use the procedure additionally for maintaining a running machine load.

41. Study the feasibility of a centralized stockroom to replace the present four in the Stores Unit, and the feasibility of mechanical materials handling systems both in this centralized stockroom and for Stock "C" and "P.I.C."

42. Combine the bulk of the functions of Stock "S" with similar functions under the Stores Unit in order to effect reductions in personnel requirements.

# CHAPTER I - ORGANIZATION

1.1 General Discussion. The Scintilla Division of Bendix Aviation Corporation is considered to be relatively autonomous. This situation makes it possible to treat many of the organizational features of Scintilla in a manner similar to that of an independent company.

In general, this approach has been employed throughout this report. However, the policies and procedures of the parent corporation that influence the organizational structure of Scintilla have been analyzed and included in applicable position descriptions and departmental appraisals.

1.11 Introduction. In order to give the reader an overall view of the goals of this chapter and to help him understand and follow the details more closely, the three major sections of this report will be briefly discussed:

a. Present Organization (1.2). This section will contain a complete organizational manual of the present organization of upper and middle management. Included therein will be a detailed description of all known committees. This approach is employed because of the lack of an existing manual of this type in the company.

b. Discussion of Present Organization and Proposed Changes (1.3). The appropriate principles of good organization are briefly discussed as applicable to this overall situation. Following this general approach, top level management and departmental relationships are examined in detail and basic recommendations are derived. The purpose of this approach is to establish an "ideal organization" - an organization which may never exist, but which the company may strive to attain. Since a need for an organization manual of the proposed "ideal organization" is not present at this time, such a manual will not be written. However, appropriate corrections will be included for all position descriptions that are affected by changes.

c. Summary of recommendations (1.4). A list of recommendations contained in the chapter.

1.2 Present Organization.

ORGANIZATION MANUAL

SCINTILLA DIVISION

BENDIX AVIATION CORPORATION

1 MAY 1957

I. OBJECTIVES OF THE SCINTILLA DIVISION, BENDIX AVIATION CORPORATION.

1. Make a reasonable profit contribution to the Corporation, thereby assisting the economic growth of the community, state and country.

2. Make only products of the best possible quality.

3. Provide customers with all necessary service and technical advice.

4. Participate in community affairs; avoid local political aspects; and encourage other industries to locate in the community.

5. Provide fair and equitable wages to all employees and provide adequate fringe benefits.

6. Maintain a policy of honesty with the employees; place trust in the employees by allowing the maximum amount of delegation of authority and responsibility throughout the Division; and encourage the "family" atmosphere.

7. Maintain an adequate system of communications with the Division, permitting the employees to know what is being accomplished and what is being planned; maintain an "open door" policy.

II. DUTIES COMMON TO ALL EXECUTIVE POSITIONS.

The following list of duties is applicable to all positions listed in this manual. The duties are included in this manner in order to stress their importance, illustrate

the marked similarities between different executive functions, and to eliminate excessive duplication.

1. Control hiring and release of subordinates in accordance with established policies.

2. Discipline and co-ordinate efforts of employees and periodically review their records with the intention of possible advancement.

3. Train understudies and other subordinates in assigned functions and designate lines of advancement.

4. Co-ordinate the activities of your position with those of others in the company; promote a group effort.

5. Simplify or eliminate all non-essential functions; continuously appraise the many costs associated with your position in order to keep them at a minimum level.

6. Keep informed and up-to-date on all matters which might contribute to efficiency and progress, making recommendations as appropriate.

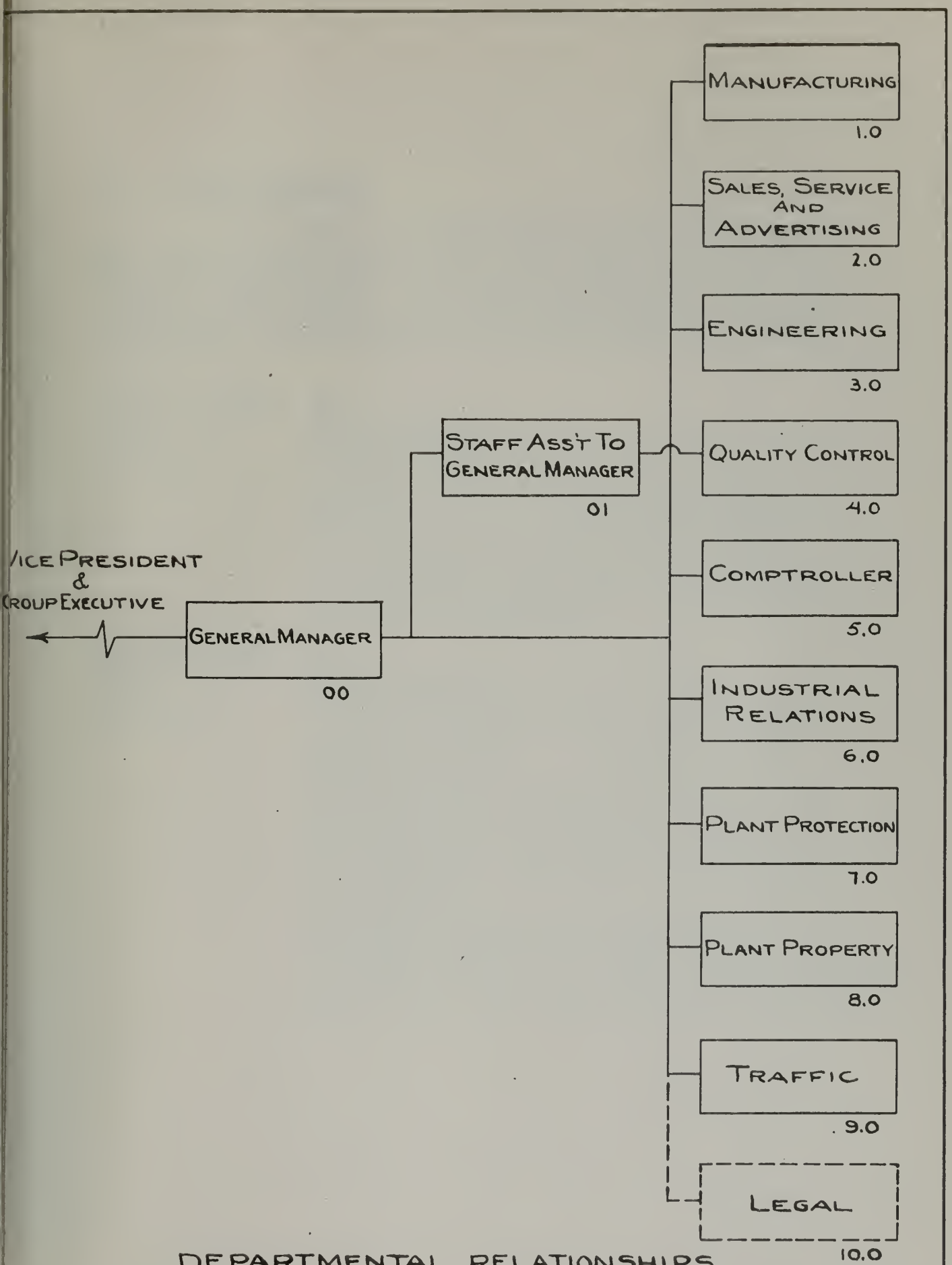
7. Support and willingly enforce decisions rendered by superiors.

8. Keep your superior informed on any matter for which he is held responsible.

9. Support company policies loyally and explain them fully to subordinates.

10. Perform additional duties as assigned by higher authority.

11. Maintain the records and files necessary for the proper performance of assigned functions.




DEPARTMENTAL RELATIONSHIPS

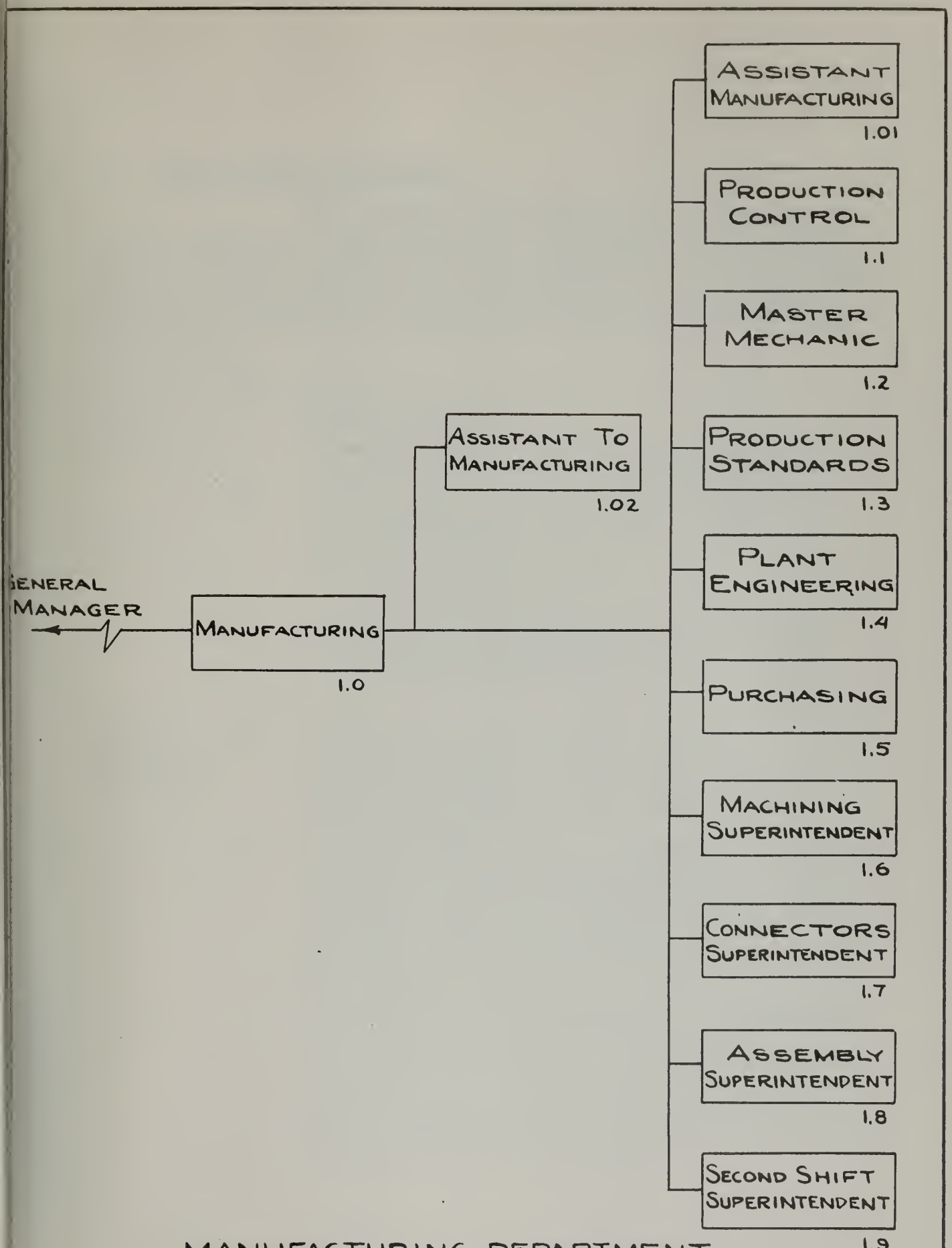
CHART 1-1

III. GENERAL MANAGER.

This office is responsible for the administrative and executive management of all activities of the Division. This position has one staff assistant whose duties are included in this section. The remaining positions that report to the General Manager, normally titled Department Manager or Director, are described in respective sections of this report.

| | |
|---|---|
| Position Number | 00 |
| Title | General Manager |
| Reports to | Vice President and Group Executive, Bendix Aviation Corporation |
| Functions | 1. Responsible for the administration and management of all activities at Scintilla Division, Bendix Aviation Corporation.<br>2. Accomplish the objectives of the Division and the parent corporation as applicable.<br>3. Ensure compliance with parent corporation policies as applicable. |

| | |
|---|---|
| Position Number | 01 |
| Title | Staff Assistant to General Manager |
| Reports to | General Manager |
| Functions | 1. Perform administrative and/or special managerial duties as designated by the General Manager.<br>2. Responsible for all activities of the Quality Control Department.<br>3. Responsible for the administration of Navy facilities contracts.<br>4. Co-ordinate with the Air Force Mobilization Program.<br>5. Conduct special engineering projects for designated products and facilities.<br>6. Control expenses for dues and subscriptions.<br>7. Prepare replies to certain types of correspondence for the General Manager's signature. |




MANUFACTURING DEPARTMENT

CHART 1-2

## IV. MANUFACTURING DEPARTMENT.

The Manufacturing Department is the largest in the Division, employing three thousand personnel. This number represents 64% of the total employment. The detailed report on this department has been carried to the first major breakdown of duties and responsibilities. The position descriptions at this level describe the functions of respective subordinates.

| | |
|---|---|
| Position Number | 1.0 |
| Title | Factory Manager |
| Reports to | General Manager |
| Functions | 1. Responsible for the economic manufacture of quality products within the time intervals established by the Sales Department.<br>2. Directs and controls the activities of the Manufacturing Department. These activities include:<br>a. Production Control<br>b. Purchasing<br>c. Master Mechanic<br>d. Production Standards and Estimating<br>e. Manufacturing Divisions<br>f. Plant Engineering |

| | |
|---|---|
| Position Number | 1.01 |
| Title | Assistant Factory Manager |
| Reports to | Factory Manager |
| Functions | 1. Assume responsibility for the Manufacturing Department in the absence of the Factory Manager.<br>2. Responsible for the supervision of the following manufacturing divisions: Process Chemist, Processes and Supply Stores, Die Casting, Rubber and Plastic Molding, Ceramics, Heat Treating, Welding, Painting, Plating, Process Control Laboratory, Scrap, and Janitor Force.<br>3. Co-ordinate with the Master Mechanic for the improvement of methods in assigned manufacturing sections.<br>4. Responsible for the maintenance of instruments used in the Manufacturing Department.<br>5. Co-ordinate supervision between shifts in specifically assigned areas. |

6. Control amount of scrap and rework run in assigned area.
7. Plan work to be run through own divisions.
8. Meet monthly schedule promulgated by Production Control.

Position Number 1.02
Title Assistant to Factory Manager
Reports to Factory Manager
Functions
1. Perform special assignments within the Manufacturing Department as assigned by the Factory Manager.
2. Supervise and direct the completion of the special mobilization study.

Position Number 1.1
Title Production Manager
Reports to Factory Manager
Functions
1. Direct and control the flow of raw materials, work in process, finished parts, and tooling by establishing manufacturing schedules and securing compliance thereto; utilizing available engineering standards to the maximum extent possible.
2. Supervise the analysis of parts and materials required to meet delivery schedules, the issuing of purchase requisitions, shop contracts covering such requirements, and maintain material data specification sheets for production planning.
3. Responsible for the management of inventory.
4. Responsible for the proper control of all changes to schedules, products, or parts thereto in regard to manufacturing.
5. Responsible for the proper functioning of of the tabulating department, co-ordinating the flow and assignment of work.
6. Co-ordinate with other manufacturing sections in regard to tooling, tool repair, layout data, and material control in order to ensure uniformity in meeting changes and in manufacturing new products.
7. Responsible for detailed co-ordination with the Engineering and Sales Departments.
8. Maintain the detailed records necessary to perform the above functions.

| | |
|---|---|
| Position Number | 1.2 |
| Title | Master Mechanic |
| Reports to | Factory Manager |
| Functions | 1. Responsible for the economic and efficient completion of all tools, dies, gages, fixtures, and jigs.<br>2. Supervise the drafting and designing of tools, dies, gages, and machines to ensure optimum tool efficiency.<br>3. Supervise the planning of layouts and processes. Execute methods and means of improving manufacturing operations.<br>4. Supervise the maintenance of toolroom machinery.<br>5. Responsible for the control of tool usage and availability.<br>6. Conduct research tests and investigations regarding new developments in machine usage. Plan and supervise the installation of such machinery and equipment and/or their repair.<br>7. Determine how and where a part, subassembly, or assembly may be most economically manufactured or assembled into a product that the Engineering Department has designed.<br>8. Authorize the purchase of standard tools and arrange for outside contractors to design and/or build tools, dies, gages, fixtures and special equipment. |

| | |
|---|---|
| Position Number | 1.3 |
| Title | Production Standards and Estimating Manager |
| Reports to | Factory Manager |
| Functions | 1. Establish and maintain the production labor incentive system.<br>2. Establish production standards in regard to time required and cost of manufacture.<br>3. Responsible for the estimate of prime costs and new tooling costs.<br>4. Analyze operator work place arrangements and make recommendations to the Methods Department in order to achieve optimum productivity at the operator level.<br>5. Analyze and investigate W.I.P. inventory variance in regard to labor standards, taking corrective action in cases of out-of-line |

costs by recommending methods and tool improvements.
6. Responsible for co-ordination with the Accounting Department for material and labor estimates; Plant Engineer for plant capacity; and with the Master Mechanic for method improvements, tooling costs, and layout.

Position Number 1.4
Title Plant Engineer
Reports to Factory Manager
Functions
1. Determine, recommend, and/or approve the procurement or making of the proper types and sizes of facilities, equipment, and machines in accordance with production requirements.
2. Supervise the installation and maintenance of plant facilities, equipment, and machinery.
3. Responsible for layout, placement, and performance of equipment, including machinery, conveyor systems, complete chemical processing units, electrical lines and circuits, and exhaust systems.
4. Responsible for the accountability and status of all government facilities.

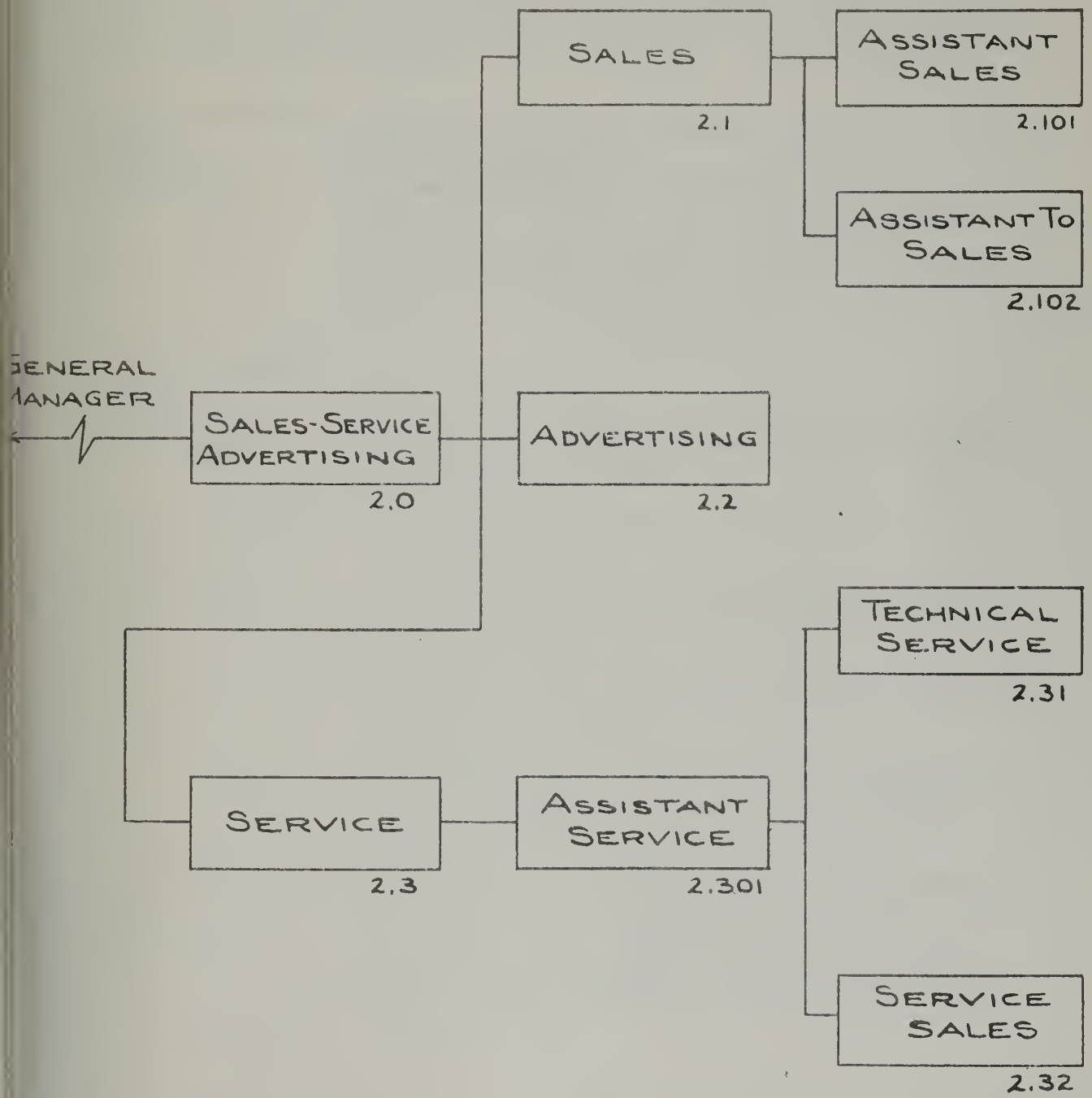
Position Number 1.5
Title Purchasing Agent
Reports to Factory Manager
Functions
1. Approve requisitions and procure the raw material, equipment, machinery, and supplies required at the most favorable prices consistent with quality, quantity, and other factors. This broad duty assignment to be performed within established policies.
2. Develop subcontracting programs, negotiate and authorize contracts with subcontractors.
3. Maintain records of purchases made, cost, terms of purchase, prices, delivery dates, and approved substitute materials.
5. Follow-up on deliveries to see that the Company's schedules are met without interruption.

| | |
|---|---|
| Position Number | 1.6 |
| Title | Manufacturing Superintendent, Machining |
| Reports to | Factory Manager |
| Functions | 1. Responsible for the supervision of the general machining departments.<br>2. Meet the monthly schedule promulgated by Production Control.<br>3. Plan work to be run through the machining departments and the machine loads for stepped-up schedules.<br>4. Co-ordinate supervision between shifts in the machining departments.<br>5. Control the amount of scrap and rework run in the department. |

| | |
|---|---|
| Position Number | 1.7 |
| Title | Manufacturing Superintendent, Electrical Connectors |
| Reports to | Factory Manager |
| Functions | 1. Responsible for the supervision of the plug-in-connectors and jet spark plug manufacturing departments.<br>2. Meet the monthly schedule promulgated by Production Control.<br>3. Plan work to be run through assigned departments and machine loads for stepped-up schedules.<br>4. Estimate all work performed in the plug-in-connector experimental department.<br>5. Operate a short-lot department for customer requirements.<br>6. Co-ordinate new designs of connectors between the Engineering and Production Departments.<br>7. Co-ordinate supervision between shifts in assigned departments.<br>8. Control amount of scrap and rework run in the department. |

| | |
|---|---|
| Position Number | 1.8 |
| Title | Manufacturing Superintendent, Assembly |
| Reports to | Factory Manager |
| Functions | 1. Responsible for the supervision of the assembly departments.<br>2. Meet the monthly schedules promulgated by Production Control.<br>3. Plan work to be run through the assembly departments. |

| | |
|---|---|
| | 4. Control the amount of scrap and rework run in the department.<br>5. Co-ordinate supervision between shifts in the assembly departments. |
| Position Number | 1.9 |
| Title | Manufacturing Superintendent, Second Shift |
| Reports to | Factory Manager |
| Functions | 1. Responsible for the supervision of the following major departments during the second and third shifts as applicable; overall machining, plug-in-connector, and jet spark plug.<br>2. Responsible for the co-ordination of supervision between shifts in and between manufacturing departments.<br>3. Control the amount of scrap and rework run in the departments assigned. |




SALES, SERVICE AND ADVERTISING DEPARTMENT

CHART 1-3

V. SALES, SERVICE AND ADVERTISING DEPARTMENT.

The major objective of this department is sales; however, considerable emphasis is placed on service. The advertising function of this department is handled by one man who works mostly through an independent advertising agency. This department is the fourth largest in the Division, employing 300 personnel. This number represents 6½% of the total employment.

| | |
|---|---|
| Position Number | 2.0 |
| Title | Director of Sales, Service, and Advertising |
| Reports to | General Manager |
| Functions | 1. Responsible for the proper functioning of the Sales, Service, and Advertising Department.<br>2. Maintain and improve customer confidence and satisfaction in the products of the division. |

| | |
|---|---|
| Position Number | 2.1 |
| Title | Sales Manager |
| Reports to | Director of Sales, Service, and Advertising |
| Functions | 1. Institute, develop, and follow-through on the use and promotion of sales techniques and campaigns.<br>2. Direct and interpret market studies, and forecasts.<br>3. Responsible for the activities of assigned personnel in the field and the home office in establishing and continuing good relations with customers.<br>4. Acquire additional sales outlets as necessary, maintaining and improving the existing distribution system.<br>5. Co-ordinate with other departments, in particular, with Engineering and Manufacturing in regard to forecasted demands, priority of efforts, and maintenance and improvement of customer good will.<br>6. Assist and/or advise in the determination by management of competitive pricing, credit, adjustment, and allowance policies.<br>7. Assist and/or advise in product development -- uses, number of items, obsolescence, and packaging. |

| | |
|---|---|
| Position Number | 2.101 |
| Title | Assistant Sales Manager |
| Reports to | Sales Manager |
| Functions | 1. Assist the Sales Manager in all assigned functions; particularly in the electrical connector, industrial products, and fuel injection fields.<br>2. Assume the responsibilities of the Sales Manager in his absence. |

| | |
|---|---|
| Position Number | 2.102 |
| Title | Assistant to Sales Manager |
| Reports to | Sales Manager |
| Functions | 1. Responsible for the office management of the Sales Department.<br>2. Assume responsibilities of Assistant Sales Manager in his absence.<br>3. Responsible for the proper functioning of the following sections of the Sales Department:<br>a. Liaison Information and Publications<br>b. Government Order Section<br>c. Spare Parts<br>d. Stock Control (Stockroom S)<br>e. Statistical Section |

| | |
|---|---|
| Position Number | 2.2 |
| Title | Advertising Manager |
| Reports to | Director of Sales, Service, and Advertising |
| Functions | 1. Responsible for the planning and placing of all advertising matter in printed form, on radio and in television.<br>2. Approve public releases and announcements pertaining to the advertising of products.<br>3. Serve as public relations representative as required.<br>4. Develop trade show exhibits and other related programs. |

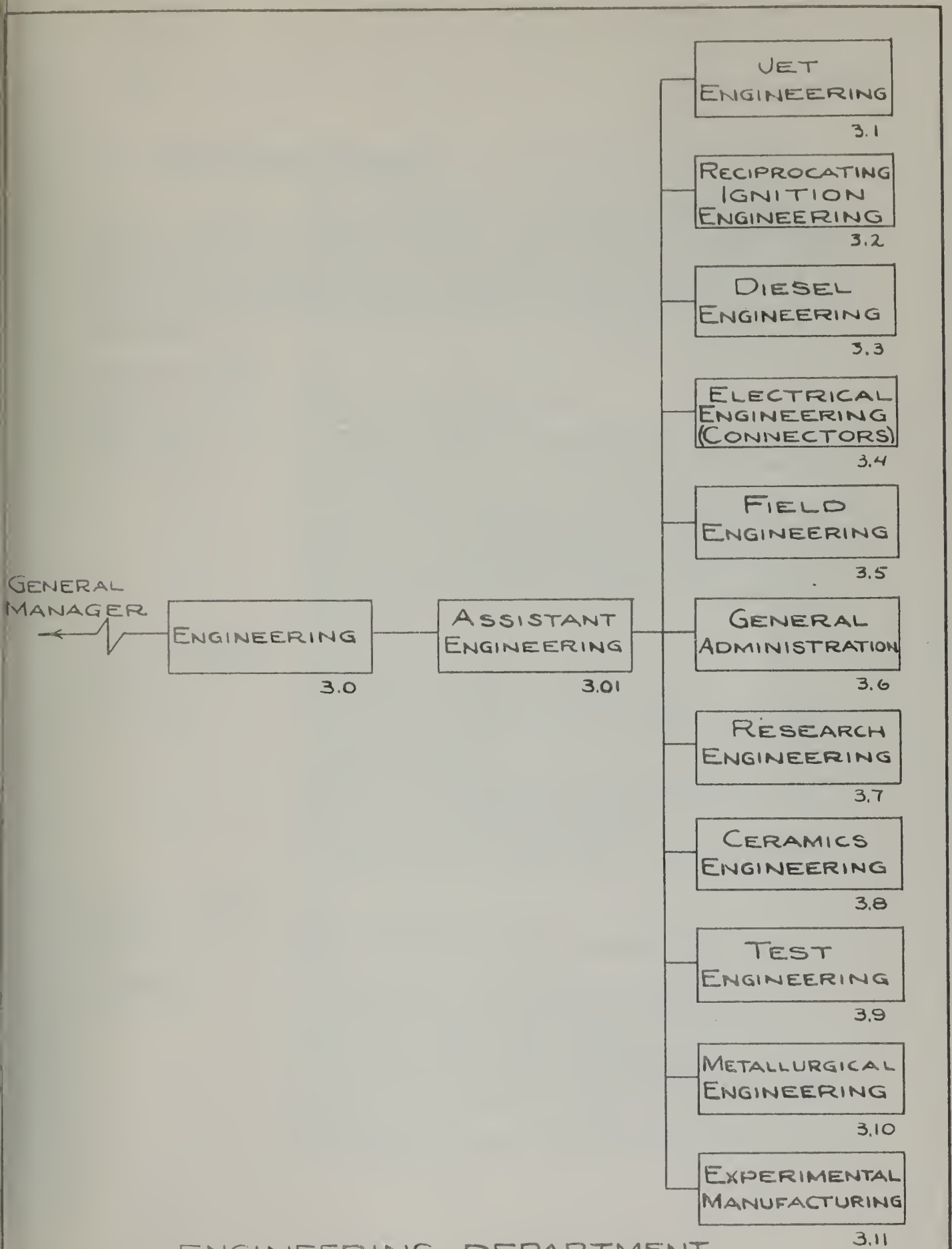
| | |
|---|---|
| Position Number | 2.3 |
| Title | Service Manager |
| Reports to | Director of Sales, Service, and Advertising |
| Functions | 1. Formulate and execute policies concerned with the providing of adequate and constantly improved customer service. |

2. Supervise or control all field and home office service personnel.
3. Plan and supervise the training of all service representatives and service personnel of designated customers.
4. Responsible for co-ordination between departments; particularly, Engineering, Manufacturing, and Quality Control in regard to unsatisfactory conditions found existing in the field.

Position Number 2.301
Title Assistant Service Manager
Reports to Service Manager
Functions
1. Assist Service Manager in the performance of his assigned functions.
2. Assume the responsibilities of the Service Manager in his absence.

Position Number 2.31
Title General Supervisor, Technical Service
Reports to Assistant Service Manager
Functions
1. Responsible for activities in the field or at Scintilla pertaining to service engineering, technical investigations, and related functions.
2. Responsible for the design and manufacture of service tools.
3. Maintain technical records, in particular:
   a. Copies of all engineering changes
   b. History for all active, inactive, and obsolete products for spare parts and replacement units.
   c. Failure reports.
   d. Field representative interview reports.
   e. Active service test records.
4. Co-ordinate information received in the field with concerned departments at Scintilla.
5. Assist in preparation of initial forecasts on stock requirements for units, parts, and tools.
6. Responsible for technical information and data in all service publications.

| | |
|---|---|
| Position Number | 2.32 |
| Title | General Supervisor, Service-Sales |
| Reports to | Assistant Service Manager |
| Functions | 1. Responsible for the promotion of sales of products to commercial users in the "after-market" category.<br>2. Handle claims requiring warranty action.<br>3. Repair, overhaul, modify, correct or replace products returned to the plant in accordance with customer requirements.<br>4. Prepare and distribute service publications. In addition, prepare material of a promotional nature as required.<br>5. Operate a service school for the training of users of our products, both commercial and military. Train additional personnel in the field as appropriate.<br>6. Negotiate yearly with the Air Force for a contract covering the services of technical representatives. Maintain appropriate records in this regard.<br>7. Assist in establishing company policies effecting distributor's territory, discount schedules, warranty and obsolescence of service items.<br>8. Process orders for "spare parts". Handle correspondence and reports in this category. Perform this function in close co-ordination with the sales order section of the sales department. |




ENGINEERING DEPARTMENT

CHART 1-4

## VI. ENGINEERING DEPARTMENT.

This department is basically responsible for all engineering activities. The description of responsibilities for the Design, Laboratories, and Experimental Manufacturing Departments are to be found in this section. A total of 478 personnel are assigned to this department, this number represents approximately 10% of the total Division employment.

| | |
|---|---|
| Position Number | 3.0 |
| Title | Director of Engineering |
| Reports to | General Manager |
| Functions | 1. Control and co-ordinate all engineering activities and advise management on engineering problems.<br>2. Supervise directly, or through designated assistants, the Development and Research Departments, the Laboratories, the Design Section, the Experimental Department, Field Engineering, and other allied engineering projects. |

| | |
|---|---|
| Position Number | 3.01 |
| Title | Assistant Director of Engineering |
| Reports to | Director of Engineering |
| Functions | 1. Responsible for co-ordination and supervision of specifically designated sections of Engineering.<br>2. When required, performs the duties of the Director of Engineering, reporting at such time to the General Manager.<br>3. Perform cost estimation on paid Research and Development contracts. |

| | |
|---|---|
| Position Number | 3.1 |
| Title | Chief Engineer, Jet |
| Reports to | Director and Assistant Director of Engineering |
| Functions | 1. Responsible for supervising and co-ordinating all engineering, designing, laboratory work, development, etc., in connection with the Jet Group.<br>2. Co-ordinate company activities with customers, including Air Force, Navy, etc., as required.<br>3. Establish target delivery dates and follow up on progress. |

4. Acquaint the Manufacturing Department in regard to the precautions required in the production of components released with new processing procedures.
5. Review designs, results of tests, and eliminate unnecessary delays within the limits of responsibilities.
6. Co-ordinate efforts with Sales and Service, Quality Control, and Manufacturing Departments as required in arriving at design configurations.

Position Number 3.2
Title Chief Engineer, Reciprocating Ignition
Reports to Assistant Director of Engineering
Functions
1. Responsible for supervising and co-ordinating all engineering, designing, laboratory work, development, etc., in connection with the Reciprocating Ignition Group.
2. Co-ordinate company activities with customers, including Air Force, Navy, etc., as required.
3. Establish target delivery dates and follow up on progress.
4. Acquaint the Manufacturing Department in regard to the precautions required in the production of components released with new processing procedures.
5. Review designs, results of tests, and eliminate unnecessary delays within the limits of responsibilities.
6. Co-ordinate efforts with Sales and Service, Quality Control, and the Manufacturing Departments as required in arriving at design configurations.

Position Number 3.3
Title Chief Engineer, Diesel
Reports to Director of Engineering
Functions
1. Responsible for co-ordinating all engineering, designing, laboratory work, development, etc., in connection with diesel or other engine parts, units, or products.
2. Co-ordinate company activities with customers, including Air Force, Navy, etc., as required.

3. Establish target delivery dates and follow up on progress.
4. Acquaint the Manufacturing Department in regard to the precautions required in the production of components released with new processing procedures.
5. Review designs, results of tests, and eliminate unnecessary delays within the limits of responsibilities.
6. Co-ordinate efforts with Sales and Service, Quality Control, and the Manufacturing Departments as required in arriving at design configurations.

| | |
|---|---|
| Position Number | 3.4 |
| Title | Chief Engineer, Electrical (Connectors) |
| Reports to | Director and Assistant Director of Engineering |
| Functions | 1. Responsible for supervising and co-ordinating all engineering, designing, laboratory work, development, etc., in connection with electrical parts, units, or products.<br>2. Co-ordinate company activities with customers, including Air Force, Navy, etc., as required.<br>3. Establish target delivery dates and follow up on progress.<br>4. Acquaint the Manufacturing Department in regard to the precautions required in the production of components released with new processing procedures.<br>5. Review designs, results of tests, and eliminate unnecessary delays within the limits of responsibilities.<br>6. Co-ordinate efforts with Sales and Service, Quality Control, and the Manufacturing Departments as required in arriving at design configurations. |

| | |
|---|---|
| Position Number | 3.5 |
| Title | Chief Field Engineer |
| Reports to | Assistant Director of Engineering |
| Functions | 1. Co-ordinate and supervise all activities of Field Engineers and/or Engineering Representatives.<br>2. Assist field representatives in promoting |

good relations with customers by advising and conferring with their engineers or other representatives on engineering problems, design changes, proposed products and/or product changes.
3. Perform liaison work and act as contact man with the military services in the above functional areas.
4. Co-ordinate the development, design, and testing of ignition analyzers.
5. Act as technical consultant regarding pilot, airport, and aircraft operations.

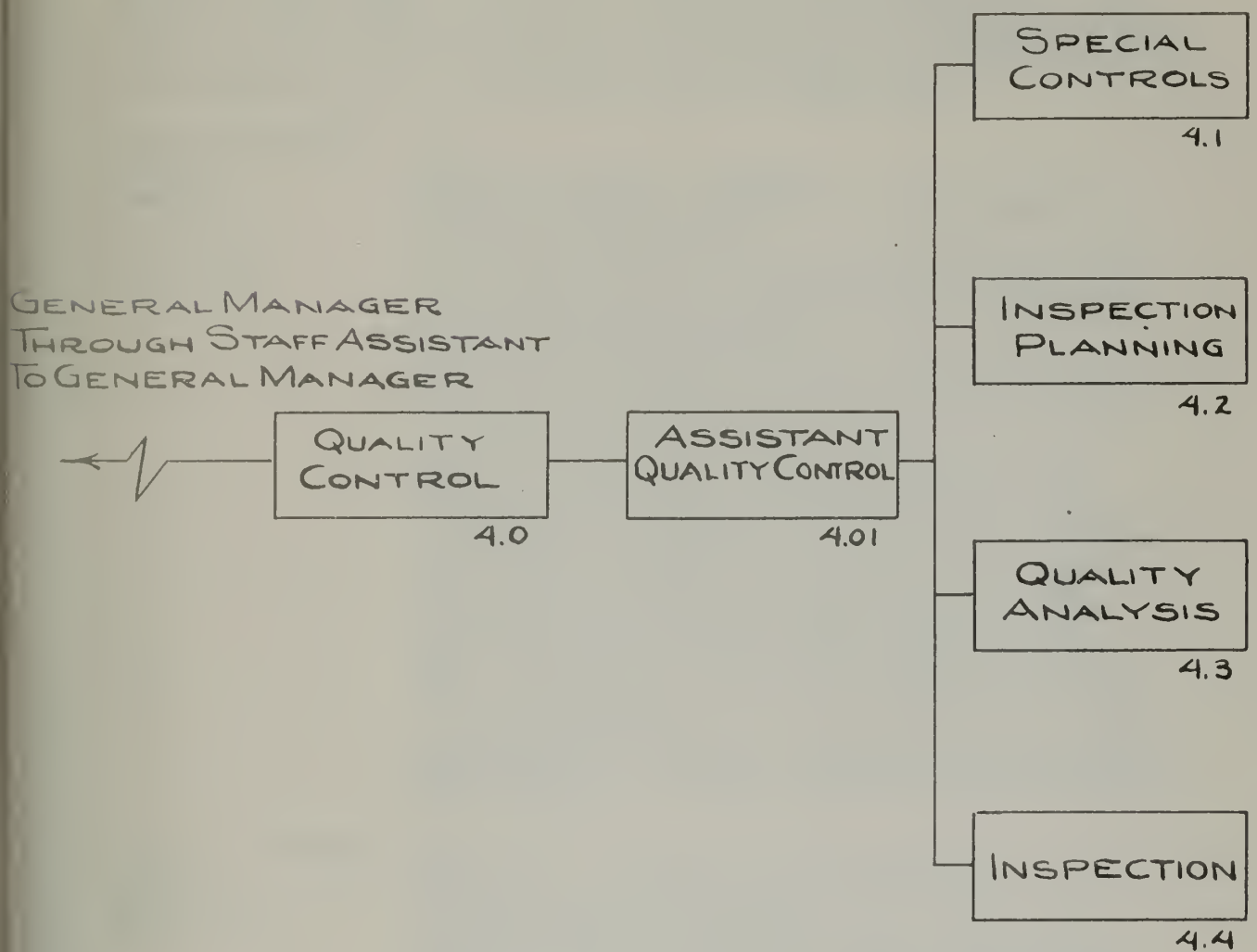
| | |
|---|---|
| Position Number | 3.6 |
| Title | Project Engineer, Senior |
| Reports to | Director and/or Assistant Director of Engineering |
| Functions | 1. Supervise, direct, and guide the following service groups and sections: Drafting, Records, Specifications and Standards, Development, Technical Writing, and Change Engineer.<br>2. Establish procedures relative to the policies of design, development, and standards within the Engineering Department, coordinating with the Master Mechanic and Quality Control Manager when such policies affect production and inspection.<br>3. Interview all technical personnel desiring employment in the Engineering Department.<br>4. Correlate with the Chief Engineer, Design, the rates of all non-exempt (salaried) employees assigned to their group and recommend action for increases.<br>5. Establish all Engineering educational programs in conjunction with the training supervisor.<br>6. Co-ordinate certain engineering changes and/or developments, that have no direct relationship with a special project group, with customers including Army, Navy, and Air Force as required. |

| | |
|---|---|
| Position Number | 3.7 |
| Title | Chief Engineer, Research |
| Reports to | Director of Engineering |
| Functions | 1. Responsible for the supervision of all |

| | |
|---|---|
| | Research Engineering.<br>2. Make studies of technical problems, verifying their worth and practicability by analysis and/or testing.<br>3. Conduct specific research with or without practical applications in mind, originating new products and devices, and studying and developing new and better materials. |
| Position Number | 3.8 |
| Title | Chief Ceramics Engineer |
| Reports to | Director of Engineering |
| Functions | 1. Develop or supervise the development of ceramic and/or allied products.<br>2. Supervise the creating and making of samples; conduct research with resultant material improvement and/or substitutions.<br>3. Conduct tests and submit technical reports as required.<br>4. Assist and advise relative to production problems in the field of ceramics. |
| Position Number | 3.9 |
| Title | Chief Test Engineer |
| Reports to | Director and Assistant Director of Engineering |
| Functions | 1. Supervise all activities of the Test Laboratories and conduct or supervise research and experimentation in varied engineering problems.<br>2. Responsible for the planning, layout, and conduct of all types of specified test projects. This includes the range from the investigation of ideas to a complete engineering test of performance.<br>3. Responsible for the quality and suitability of experimental shipments of prototype systems relative to their conformance to customer specifications.<br>4. Provide final test information to the Manufacturing and Quality Control Departments.<br>5. Provide and maintain electrical test equipment and standards.<br>6. Develop products originating from initial experimental samples.<br>7. Conduct official qualification testing. |

| | |
|---|---|
| Position Number | 3.10 |
| Title | Chief Metallurgical Engineer |
| Reports to | Director and Assistant Director of Engineering |
| Functions | 1. Supervise and direct the activities of the Materials Laboratories.<br>2. Conduct chemical and metallurgical research on new materials (including alloys), developing new procedures for their use.<br>3. Develop improved methods of annealing, heat treating, plating, etc., through research and experimentation.<br>4. Evaluate vendors' material where applicable to Scintilla products.<br>5. Render quality decisions pertaining to purchased materials.<br>6. Supervise or conduct research, analysis, testing, etc., in the various fields of engineering as required.<br>7. Advise and aid other departments in regard to material and process problems. |

| | |
|---|---|
| Position Number | 3.11 |
| Title | Superintendent, Experimental Department |
| Reports to | Director of Engineering |
| Functions | 1. Responsible for the operation of the Experimental and Model Making Departments.<br>2. Establish shop contracts for the procurement and construction of all experimental units.<br>3. Responsible for small lot production of customer orders, including the requisition and/or purchase of required materials and parts, required tooling and patterns.<br>4. Devise and recommend methods relative to the production of new items.<br>5. Arrange for the inspection of finished and semi-finished experimental items.<br>6. Arrange for the shipment of experimental items to the customer. |




# QUALITY CONTROL DEPARTMENT

CHART 1-5

## VII. QUALITY CONTROL DEPARTMENT.

This department is responsible for all matters pertaining to quality control and inspection. It plays a very important part in meeting the objective of the Division to produce products of only the best possible quality. A total of 574 personnel are assigned, representing approximately 12% of the total Division employment.

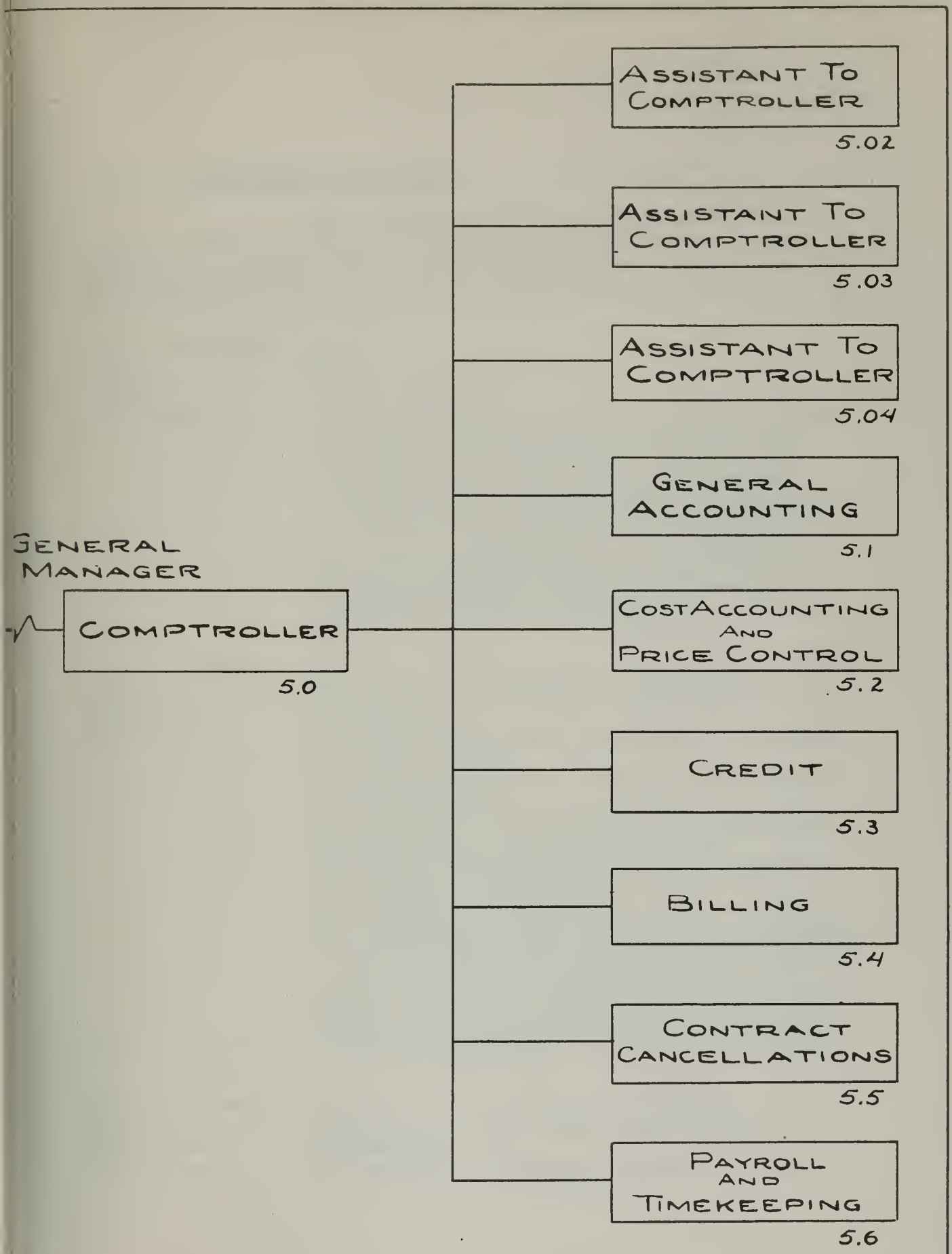
| | |
|---|---|
| Position Number | 4.0 |
| Title | Quality Control Manager |
| Reports to | General Manager through the Assistant to the General Manager. |
| Functions | 1. Responsible for the quality of all products produced and shipped by the Division and/or sub-contractors.<br>2. Co-ordinate efforts with the Service Department to analyze field failures and to initiate corrective actions.<br>3. Responsible for the inspection of all parts in process, completed units, purchased parts, and raw materials.<br>4. Maintain liaison with the Engineering Department relative to tests, test data, and specifications, maintaining the responsibility of rejecting a product and requiring corrective engineering action when a design is unsafe or unsatisfactory to a customer.<br>5. Maintain liaison with the Manufacturing Department to avoid excessive scrap and rework losses. |

| | |
|---|---|
| Position Number | 4.01 |
| Title | Assistant Quality Control Manager |
| Reports to | Quality Control Manager |
| Functions | 1. Any of the functions listed under the Quality Control Manager may be assigned to this position as desired.<br><br>2. Perform the duties of Quality Control Manager during the latter's absence. |

| | |
|---|---|
| Position Number | 4.1 |
| Title | Quality Control Supervisor (Special Controls) |
| Reports to | Quality Control Manager or Assistant Quality Control Manager |

| | |
|---|---|
| Functions | 1. Responsible for the following:<br>a. Process control, including certification of equipment and personnel.<br>b. Packaging and marking control.<br>c. Mold and die control and approval.<br>d. Liaison with the Service Department and analysis of complaints.<br>e. Liaison with vendors. |
| Position Number | 4.2 |
| Title | Quality Control Supervisor (Inspection Planning) |
| Reports to | Quality Control Manager or Assistant Quality Control Manager |
| Functions | 1. Responsible for the determination of methods and the preparation of written instructions of inspection procedures.<br>2. Formulate statistical sampling procedures.<br>3. Determine inspection stamps and marking procedures.<br>4. Co-ordinate quality control problems with the Engineering and Manufacturing Departments in regard to inspection procedures. |
| Position Number | 4.3 |
| Title | Quality Control Supervisor (Quality Analysis) |
| Reports to | Quality Control Manager or Assistant Quality Control Manager |
| Functions | 1. Responsible for the analysis of all scrap and rework.<br>2. Responsible for technical investigations and statistical analysis.<br>3. Maintain liaison with the Engineering Department for design change approval.<br>4. Responsible for the inspection record analysis and reporting.<br>5. Co-ordinate corrective action to be taken on material review repeat items. |
| Position Number | 4.4 |
| Title | Chief Inspector |
| Reports to | Quality Control Manager or Assistant Quality Control Manager |
| Functions | 1. Supervise and direct all inspection activities for adherence to drawings and specifications. |

2. Co-ordinate work with the Manufacturing, Engineering, and Quality Control Supervisors.
3. Work towards the elimination of scrap and rework.




ACCOUNTING DEPARTMENT

CHART 1-6

VIII. ACCOUNTING DEPARTMENT.

This department is responsible for the financial and accounting procedures of the Division, within policies as established by the Corporation. A total of 155 personnel are assigned, representing approximately 3% of the total Division employment.

| | |
|---|---|
| Position Number | 5.0 |
| Title | Comptroller |
| Reports to | General Manager |
| Functions | 1. Supervise and formulate all accounting procedures for the Division within the established policies of the Corporation.<br>2. Direct the preparation of financial statements for the guidance of management.<br>3. Analyze and appraise the financial results of the operations of the Division.<br>4. Approve expenditures as authorized by the General Manager and/or Corporation.<br>5. Supervise the preparation of the cost of sales report. |

| | |
|---|---|
| Position Number | 5.02 |
| Title | Assistant to Divisional Comptroller |
| Reports to | Comptroller |
| Functions | 1. Prepare the annual forecast of overhead or burden rates.<br>2. Prepare the annual forecast of income-profit and loss.<br>3. Evaluate all items sent on consignment and charge to the proper account.<br>4. Prepare the breakdown of all purchases and sales by product.<br>5. Determine the profit or loss on government contracts subject to re-determination.<br>6. Audit government contracts upon request.<br>7. Aid in determining the procedure for taking the annual physical inventory and prepare the necessary written instructions.<br>8. Prepare any special reports as desired by the Comptroller. |

| | |
|---|---|
| Position Number | 5.03 |
| Title | Assistant to Divisional Comptroller |
| Reports to | Comptroller |
| Functions | 1. Co-signer of company checks. |

2. Responsible for the posting, balancing, and preparation of the General Ledger.
3. Prepare the balance sheet and profit and loss statement.
4. Maintain accruals relative to compensation and liability insurance, employees separation and use & occupancy, and royalties.
5. Prepare special reports as desired by the Comptroller.

Position Number 5.04
Title Assistant to Divisional Comptroller and Assistant Secretary, Bendix Aviation Corporation.
Reports to Comptroller
Functions
1. Responsible for the coding of all invoices.
2. Prepare the sales journal.
3. Sign Division checks and approve travel advance requisitions.
4. Approve petty cash vouchers.
5. Sign government contracts and similar documents as Assistant Secretary.
6. Prepare special reports as desired by the Comptroller.

Position Number 5.1
Title Superviser, General Accounting
Reports to Comptroller
Functions
1. Direct and supervise the general accounting functions.
2. Direct and supervise accounts payable and accounts receivable.
3. Audit and approve vouchers before payment.
4. Audit purchase orders for correct charge accounts.
5. Maintain necessary data on capital assets, special facilities, and depreciation.

Position Number 5.2
Title Supervisor, Cost and Pricing
Reports to Comptroller
Functions
1. Responsible for the allocation of all labor performed on a job to the correct work order and account.
2. Supervise the computing and establishing of selling costs and prices.

3. Co-ordinate work with General Accounting, Cost Estimating, Sales, and Engineering.
4. Responsible for the evaluation and costing of inventory.

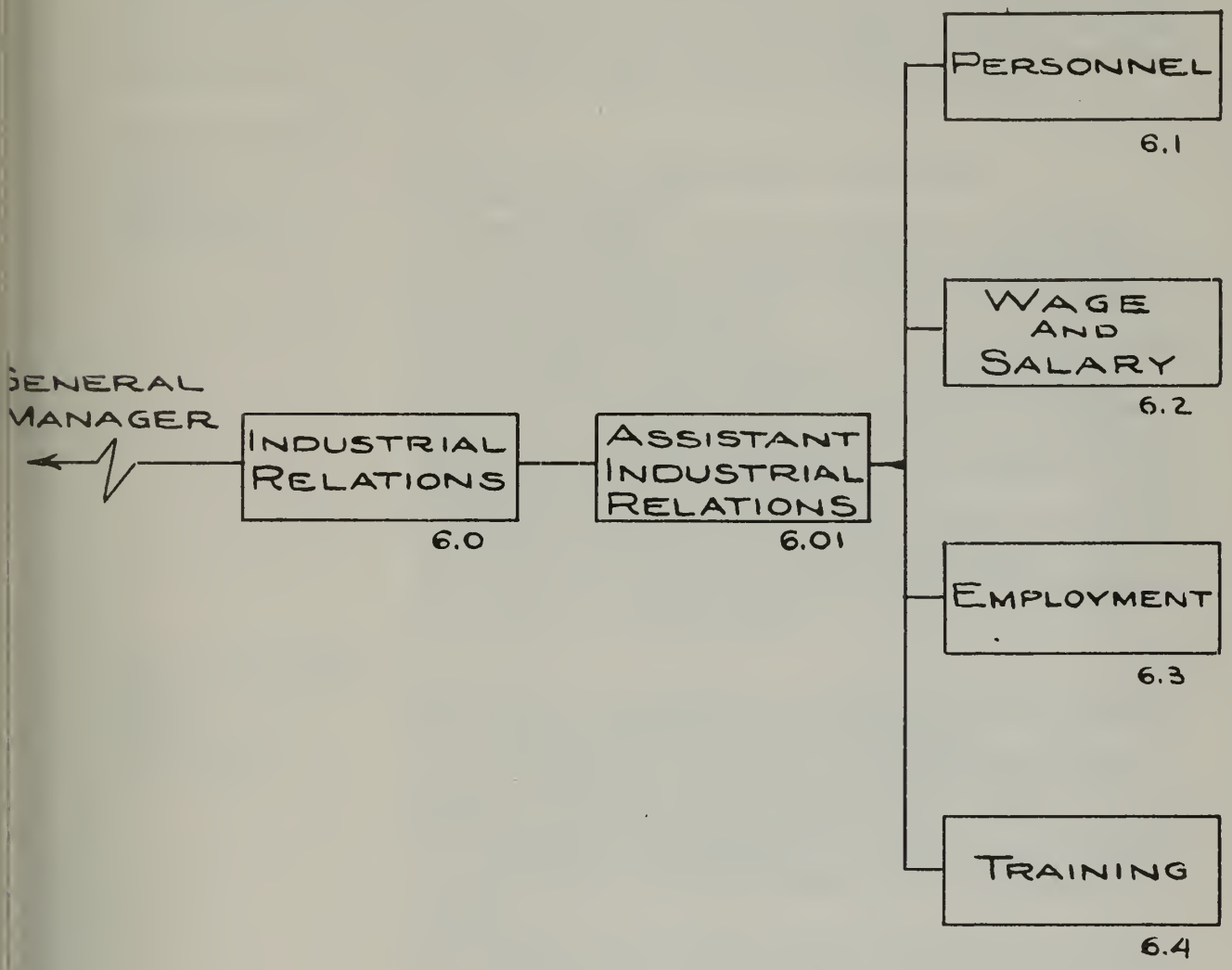
Position Number 5.3
Title Credit Manager
Reports to Comptroller
Functions
1. Responsible for the establishment and follow-up on all credit ratings of customers, dealers, and sub-contractors.
2. Review customers' debit memoranda, determining proper action.
3. Obtain information as required through credit rating agencies and/or personal investigations.
4. Initiate action as necessary on past-due accounts.
5. Maintain close liaison with the Sales Department.

Position Number 5.4
Title Supervisor, Billing Section
Reports to Comptroller
Functions
1. Responsible for the computations, checking, and control of all billing.
2. Initiate correspondence with customers concerning the correctness of invoices.
3. Co-ordinate closely with General Accounting, Credit, Price Control, Sales, and Service sections.
4. Maintain records of purchase orders, invoices, and shippers.

Position Number 5.5
Title Supervisor, Contract Terminations
Reports to Comptroller
Functions
1. Supervise and co-ordinate the performance of all necessary administrative functions in order to compute balances and close out cancelled orders and/or contracts. This includes, but is not limited to, the following:
   a. The gathering, presentation, and negotiation with the Government or other customers of the costs properly allocable to terminations.

b. The supervision, audit, and approval of all sub-contractors' and vendors' termination claims.
c. The invoicing of claims and the vouchering of all termination transactions.
d. The approval of all material dispositions and the approval for payment after settlement.
e. The maintenance of adequate subsidiary records.
f. The training of sub-contractors and vendors in termination procedures.

| | |
|---|---|
| Position Number | 5.6 |
| Title | Supervisor, Payroll |
| Reports to | Comptroller |
| Functions | 1. Supervise the accurate maintenance and checking of time cards and job cards.<br>2. Responsible for the payroll computations and distribution.<br>3. Co-ordinate the work of the Machine Accounting Section with the various departments utilizing such reports as sales journal, personnel analysis, personnel inventory, sales analysis, budget reports, and cost accounting reports.<br>4. Responsible for the disbrusement of petty cash. |




INDUSTRIAL RELATIONS DEPARTMENT

CHART 1-7

## IX. INDUSTRIAL RELATIONS DEPARTMENT.

This department is responsible for all matters pertaining to or included in the field of industrial and employee relations. The details of the responsibilities are outlined in the respective position descriptions in this section. A total of 23 personnel are assigned, representing approximately 0.5% of the total Division employment.

| | |
|---|---|
| Position Number | 6.0 |
| Title | Director of Industrial Relations |
| Reports to | General Manager |
| Functions | 1. Responsible for all matters pertaining to or included in the field of industrial and employee relations and to advise management in these areas.<br>2. Supervise directly, or through designated assistants, the functions of recruiting, hiring, testing, labor relations, employee relations, training, wage and salary administration, plant magazine, and public relations related to employees.<br>3. Responsible for the formulation of basic policies in each of the above areas.<br>4. Ensure compliance with parent Corporation policies as applicable |

| | |
|---|---|
| Position Number | 6.01 |
| Title | Assistant Director of Industrial Relations |
| Reports to | Director of Industrial Relations |
| Functions | 1. Responsible for the co-ordination and supervision of specifically designated sections of Industrial Relations.<br>2. Represent management in grievance meetings, union negotiations, and arbitration cases.<br>3. Perform the duties of the Director of Industrial Relations when required, reporting at such time to the General Manager.<br>4. Responsible for technical personnel recruitment. |
| Position Number | 6.1 |
| Title | Personnel Administrator |
| Reports to | Director of Industrial Relations |
| Functions | 1. Responsible for specified functions related to employee relations and employee services such as the handling of grievances, |

administering of certain industrial relations policies, and the administering of collective bargaining provisions.
2. Responsible for conducting exit interviews and employee and supervisory counseling.
3. Responsible for bulletin boards, review and co-ordination of non-exempt employees sick leave, orientation of non-exempt employees, hourly employee pension program, and authorization of jury duty allowances for hourly employees.

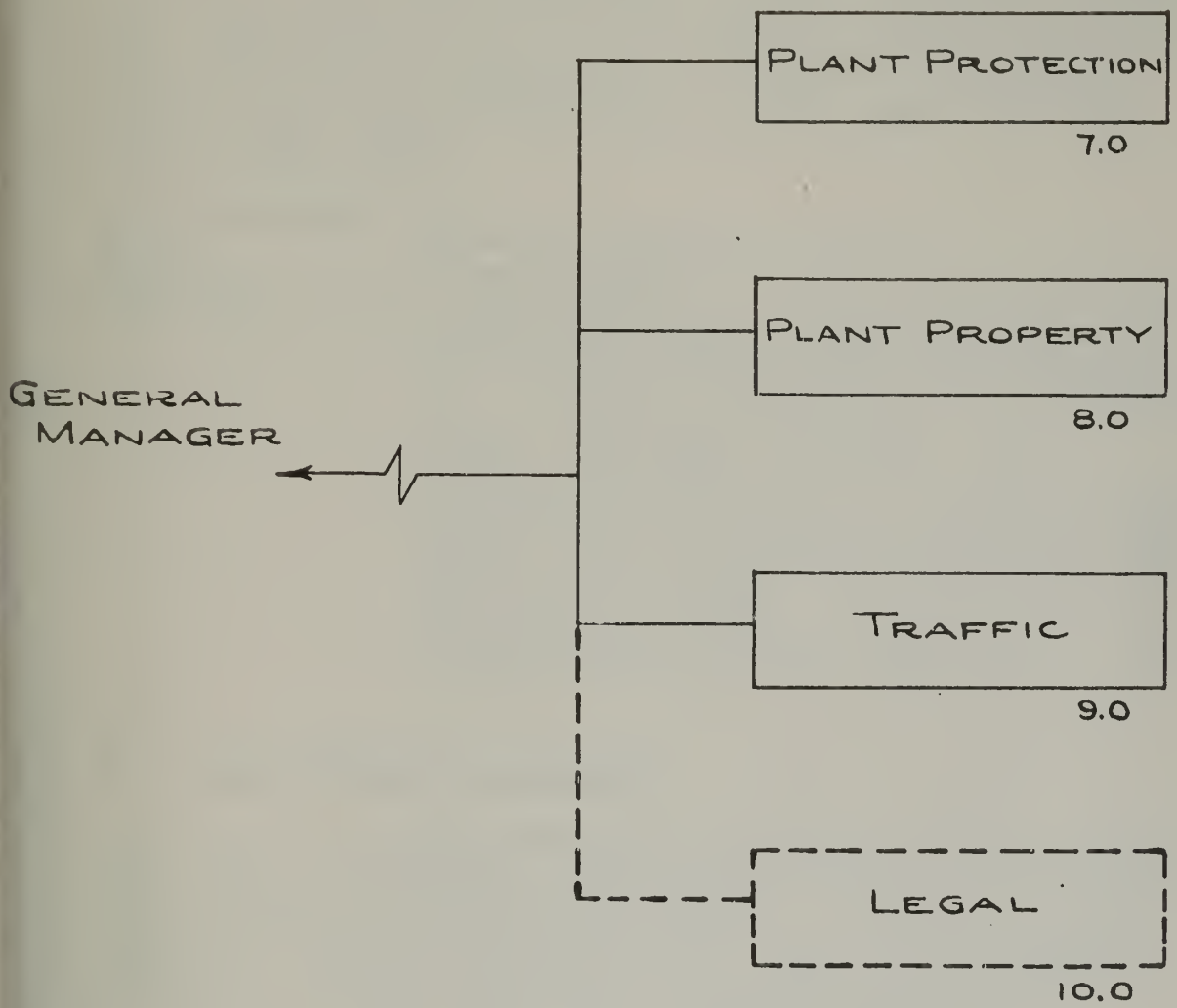
Position Number 6.2
Title Wage and Salary Administrator
Reports to Director of Industrial Relations
Functions
1. Responsible for wage and salary administration in accordance with Government, and Divisional policies.
2. Write job descriptions, make job evaluations, investigate and approve rate changes.
3. Investigate and recommend hiring and promotional rates and merit increases in order to insure uniformity of administration.
4. Substantiate the necessity for changes and verify the correctness of rate structure through continuous investigation of local, competitor, state, and national rates to insure compatibility.
5. Co-ordinate hiring rates with the Employment Supervisor, evaluating experience, etc.
6. Check promotional increases with appropriate Supervisors, Personnel Administrator, and Supervisor of Training.
7. Discuss merit increases with supervisors, recommending action or postponement on an individual performance basis.
8. Determine actual amounts of increases in order to maintain a plant-wide balance.
9. Check and correct instances of neglected or delayed merit rating, reporting as required.

Position Number 6.3
Title Employment Supervisor
Reports to Director of Industrial Relations
Functions
1. Responsible for recruiting, hiring, and follow-up procedures in connection with industrial and office employment.

2. Responsible for maintaining all personnel records including seniority, selective service, attendance, transfers, promotions, etc.
3. Advise supervisors relative to the moves of hourly employees affected by the seniority provisions of the collective bargaining agreement.
4. Responsible for the submission of labor reports to New York State and Federal Governments.

| | |
|---|---|
| Position Number | 6.4 |
| Title | Training Supervisor |
| Reports to | Director of Industrial Relations |
| Functions | 1. Responsible for the planning, organizing, and administering of training programs designed to promote efficiency through instruction of new employees in company policies, systems, and routines.<br>2. Conduct advanced training for foremen and supervisors and arrange and participate in craft training as required.<br>3. Equip, arrange, and schedule the use of the training center, including product displays.<br>4. Plan, write, and supervise the publication of training literature and materials.<br>5. Review, select, and supervise the distribution of training materials.<br>6. Select and maintain audio-visual equipment and other training aids.<br>7. Select, organize, and maintain the training reference library.<br>8. Establish, maintain, and co-ordinate training with outside agencies.<br>9. Conduct investigations and surveys to determine the need for personnel tests and/or testing, including the selection of tests and the establishment of appropriate administrative procedures.<br>10. Responsible for the administration of the Scintilla suggestion system, ensuring efficiency and effectiveness.<br>11. Manage the Plant Publication, "The Scintillator".<br>12. Responsible for the co-ordination and arrangement of certain public and employee |

relations activities such as plant tours, open house, various community group meetings, etc.




PLANT PROTECTION, PLANT PROPERTY, TRAFFIC, AND LEGAL DEPARTMENTS

CHART 1-8

X. PLANT PROTECTION DEPARTMENT.

This department is responsible for all activities pertaining to security, medical, cafeteria, safety, and communications. All of the primary responsibilities of this department are described in the Divisional Security Officer's position description. A total of 65 personnel are assigned, representing approximately 1½% of the total Division employment.

| | |
|---|---|
| Position Number | 7.0 |
| Title | Divisional Security Officer |
| Reports to | General Manager |
| Functions | 1. Responsible for compliance with all laws, regulations, and procedures pertaining to security requirements and safeguards that are, or may be, established by the Scintilla Division including government agencies such as AEC, Department of Defense, etc.<br>2. Supervise directly, or through designated assistants, the functions of medical, cafeterial, plant protection activities, plant guard forces, safety, communications, mail, and office supplies.<br>3. Responsible for the formulation of basic policies in each of the above areas. |

XI. PLANT PROPERTY DEPARTMENT.

This department is responsible for the erection, care, maintenance, and alteration of the Division's power plant, building, and properties. All of the primary responsibilities of this department are described in the Supervisor, Property and Facilities position description. A total of eleven personnel are assigned, representing approximately 0.2% of the total Division employment.

| | |
|---|---|
| Position Number | 8.0 |
| Title | Supervisor, Properties and Facilities |
| Reports to | General Manager |
| Functions | 1. Responsible for the erection, care, maintenance, alteration, etc., of the Division's power plant, buildings and/or properties.<br>2. Represent the Division in discussions with consultants, and Architectural and Engineering contractors regarding construction |

and major maintenance of buildings and/or facilities.
3. Co-ordinate the activities of the Division in the above-assigned areas with all State and Federal Governmental agencies as required.
4. Ensure compliance with Corporation policies as applicable.

XII. TRAFFIC DEPARTMENT.

This department is responsible for shipping, receiving, packaging, and traffic. All of the major functions of the department have been included in the position description of the Traffic Manager. A total of 149 personnel are assigned, representing approximately 3% of the total Division employment.

| | |
|---|---|
| Position Number | 9.0 |
| Title | Traffic Manager |
| Reports to | General Manager |
| Functions | 1. Responsible for the packaging, preservation, and shipping of all outgoing materials.<br>2. Route all incoming and outgoing shipments and trace shipments that are either lost or delayed in transit.<br>3. Responsible for the receiving and checking of all incoming shipments for damage and correctness of items and quantity.<br>4. Operate and maintain the trucks and passenger cars owned by the Division.<br>5. Arrange travel and hotel reservation for company personnel.<br>6. Co-ordinate the operation and maintenance of the Division's airport and airplanes.<br>7. Administer the petty cash fund for all local material purchases up to $25. |

XIII. LEGAL DEPARTMENT.

This position is responsible for advising management concerning its legal rights, obligations, and privileges. It is not a full-time position, and is administered on a legal consultant basis with offices located in New York City.

| | |
|---|---|
| Position Number | 10.0 |
| Title | Divisional Attorney |
| Reports to | General Manager |
| Functions | 1. Advise management concerning its legal rights, obligations, and privileges.<br>2. Advise in specialized areas such as contract and corporation law.<br>3. Act as agent in various transactions and performs general legal duties as required. |

XIV. COMMITTEES.

Committees are employed as an important method of managing departments and co-ordinating work between departments. The following tabulation illustrates the extent of utilization, the basic responsibility and authority, and the composition of all know committees at Scintilla.

DAILY

| | |
|---|---|
| Name | Material Review Board |
| Purpose | Established in accordance with an Air Force specification to review all discrepant material (not rework) which deviates from blueprints and specifications; and to decide (decision must be unanimous) the disposition of the material. |
| Chairman | None |
| Members | Quality Control Manager (as required)<br>Air Force Quality Control Representative<br>Material Review and Corrective Action Project Engineer<br>Inspection Foreman (Material Review and Salvage) |
| Remarks | Inspectors assist in the handling and inspection of material as required. |

| | |
|---|---|
| Name | Inspection-Service Meeting |
| Purpose | Investigate customers' complaints, exchange findings and results, and determine necessary action on items returned from the field. |
| Chairman | None |
| Members | Quality Control<br>Representative from Service Complaint Analysis Service<br>Supervisor, Technical Investigation<br>Supervisor, Customers' Contacts<br>Assistant Supervisor, Customers' Contacts Service Repair |

WEEKLY

| | |
|---|---|
| Name | Production-Inspection-Engineering Committee |
| Purpose | Discuss any problems concerned with Production, Inspection, and Engineering which require joint action or recommendations. |
| Chairman | Assistant Quality Control Manager |

| | |
|---|---|
| Members | Manufacturing<br>Master Mechanic<br>Assistant Master Mechanic<br>Factory Superintendents<br>Supervisor, Heat Treating and Plating<br>Other supervisors as required<br>Engineering<br>Material Review and Corrective Action Project Engineer<br>Inspection<br>Quality Control Supervisor (Quality Analysis )<br>Chief Inspector<br>Assistant Chief Inspectors<br>Inspectors as required |
| Name | Grievance Committee |
| Purpose | Provide the opportunity for the Union Committee to meet with management in order to process grievances at the third state. The presentations are to be in conformance with the formal grievance procedure as outlined in the Collective Bargaining Agreement. |
| Chairman | Union representative |
| Members | Union Representatives<br>President of Local 1529, International Association of Machinists<br>Two Chief Stewards<br>Three Grievance Committeemen<br>Business Agent<br>Division Representatives<br>Director of Industrial Relations<br>Assistant Director of Industrial Relations<br>Personnel Administrator |
| Name | Manufacturing Shortage Committee -- Plug-in Connectors |
| Purpose | Determine items, manufactured or purchased, that are delaying production previously scheduled. Take steps to improve delivery of the delinquent items to assembly lines or machines. |
| Chairman | Production Control and Expeditor Supervisor |
| Members | Assistant Chief Inspector Assembly and Process Inspection and Test<br>Assistant Purchasing Agent<br>Manufacturing Superintendent - Assembly<br>Manufacturing Superintendent - Plug-in Connectors<br>Manufacturing Superintendent - Machining |

| | |
|---|---|
| Name | Manufacturing Shortage Committee -- Diesel |
| Purpose | Determine items, manufactured or purchased, that are delaying production previously scheduled. Take steps to improve delivery of the delinquent items to assembly lines or machines. |
| Chairman | Production Control and Expeditor Supervisor |
| Members | Supervisor Assembly Inspection<br>Assistant Purchasing Agent<br>Manufacturing Superintendent - Assembly<br>Manufacturing Superintendent - Machining |

| | |
|---|---|
| Name | Manufacturing Shortage Committee -- Leads and Harnesses |
| Purpose | Determine items, manufactured or purchased, that are delaying production previously scheduled. Take steps to improve delivery of the delinquent items to assembly lines or machines. |
| Chairman | Production Control and Expeditor Supervisor |
| Members | Assistant Chief Inspector Assembly and Process Inspection and Test<br>Assistant Purchasing Agent<br>Manufacturing Superintendent - Assembly<br>Manufacturing Superintendent - Machining |

| | |
|---|---|
| Name | Manufacturing Shortage Committee -- Spare Parts |
| Purpose | Determine items, manufactured or purchased, that are delaying production previously scheduled. Take steps to improve delivery of the delinquent items to assembly lines or machines. |
| Chairman | Production Control and Expediting Supervisor |
| Members | Assistant Chief Inspector for Purchases and Manufactured Parts and Material<br>Assistant Purchasing Agent<br>Manufacturing Superintendent - Assembly<br>Manufacturing Superintendent - Plug-in-connectors<br>Manufacturing Superintendent - Machining |

| | |
|---|---|
| Name | Manufacturing Shortage Committee -- Jet Ignition |
| Purpose | Determine items, manufactured or purchased, that are delaying production previously scheduled. Take steps to improve delivery of the delinquent items to assembly lines or machines. |
| Chairman | Production Control and Expeditor Supervisor |
| Members | Assistant Chief Inspector, Assembly and Process Inspection and Test<br>Assistant Purchasing Agent<br>Manufacturing Superintendent - Assembly<br>Manufacturing Superintendent - Machining |

| | |
|---|---|
| Name | Manufacturing Shortage Committee -- Magneto |
| Purpose | Determine items, manufactured or purchased, that are delaying production previously scheduled. Take steps to improve delivery of the delinquent items to assembly lines or machines. |
| Chairman | Production Control and Expeditor Supervisor |
| Members | Assistant Chief Inspector for Purchases and Manufactured Parts and Material<br>Assistant Purchasing Agent<br>Manufacturing Superintendent - Assembly<br>Manufacturing Superintendent - Machining |

| | |
|---|---|
| Name | Electrical Connector Meeting |
| Purpose | 1. Discuss status of connector projects between Sales and Engineering Departments.<br>2. Discuss design, customer complaints, and packaging problems. |
| Chairman | Director of Engineering |
| Members | Engineering<br>Chief Engineer, Electrical (connectors)<br>Senior Project Engineer, New Development<br>Project Engineer, Production and Standard Series<br>Sales<br>Sales Manager<br>Assistant Sales Manager<br>Supervisor Electrical Connectors<br>Assistant Supervisor Electrical Connectors<br>Service<br>Assistant Service Manager<br>Others as required according to product. |

| | |
|---|---|
| Name | Electrical Connector Committee |
| Purpose | Investigate and expedite delinquent items in electrical connector manufacture. |
| Chairman | Factory Manager |
| Members | Production Control Manager<br>Chief Expeditor for Electrical Connectors<br>Supervisor of Electrical Connector Department |

| | |
|---|---|
| Name | Service Engineering Committee |
| Purpose | Investigate and take a ppropriate corrective action on customer complaints in regard to design of products. |
| Chairman | Chief Engineer, Reciprocating Ignition |
| Members | General Supervisor Technical Service<br>Assistant Service Manager<br>Supervisor of Service Engineering<br>Others as required |

| | |
|---|---|
| Name | Diesel Committee |
| Purpose | Determine progress of Engineering project for individual customers. Establish priorities as required. |
| Chairman | Supervisor Diesel Fuel Injection Equipment, Sales |
| Members | Assistant Sales Manager<br>Chief Engineer, Diesel<br>Director of Engineering<br>Factory Manager<br>Senior Project Engineer, Drafting (Diesel) |

| | |
|---|---|
| Name | Suggestion System Committee |
| Purpose | 1. Evaluate all suggestions after a thorough investigation has been made by the departments involved.<br>2. Establish awards for suggestions in accordance with the provisions of Section G of the "Bendix Suggestion System" pamphlet.<br>3. Assist and advise the individual responsible for the administration of the Division's Suggestion System. |
| Chairman | Training Supervisor |
| Members | Master Mechanic<br>Senior Methods Engineer<br>Manager Production Standards and Estimating<br>Supervisor Cost Estimating and Machine Load<br>Cost Estimator (Cost Estimating and Machine Load Section)<br>Senior Clerk, Training Section |

| | |
|---|---|
| Name | Pricing Committee |
| Purpose | Investigate and assist in the procedures of establishing prices on various products. Expedite the normal pricing procedure. |
| Chairman | Assistant to Sales Manager |
| Members | Supervisor, Costing and Pricing<br>Estimator, Production Standards and Estimating Section<br>Supervisor of Product Group, Sales as appropriate |

| | |
|---|---|
| Name | Industrial Ignition Committee |
| Purpose | Co-ordinate and establish target dates for Engineering to meet customer deadlines in regard to design. Establish priorities as required. |
| Chairman | Supervisor Industrial Projects, Sales |
| Members | Assistant Sales Manager<br>Chief Engineer, Reciprocating Ignition<br>Project Engineer, as appropriate |

| | |
|---|---|
| Name | Methods Committee |
| Purpose | Analyze and discuss methods for production, and progress on related projects; resolve problems that have arisen in this area. |
| Chairman | Master Mechanic |
| Members | Supervisor Methods Engineering<br>Supervisor Production Standards<br>Additional personnel as required |

| | |
|---|---|
| Name | Small Contracts Committee |
| Purpose | Evaluate economic lot sizes versus inventory value of obsolescence. |
| Chairman | Supervisor of Production Planning and Control |
| Members | Supervisor of Estimating<br>Spare Parts Supervisor, Sales Department |

## WEEKLY - AS REQUIRED

| | |
|---|---|
| Name | Tool Information Committee (formerly called the Production Comment Committee, PCC |
| Purpose | 1. Responsible for releasing to production the required tools and quantities to meet production requirements and delivery schedules.<br>2. Provide tooling compatible with sales forecasts and price considerations by the authorization of Class I, Class II, or PPL release. |
| Chairman | Chief, Record Section, Engineering Department |
| Members | Assistant Director of Engineering<br>Chief Engineer (as required by product)<br>Master Mechanic<br>Supervisor, Production Engineering Co-ordinator<br>Service Engineer (as required)<br>Assistant Supervisor, Sales (by product)<br>Estimator, Production Standards and Estimating Section, Manufacturing |

| | |
|---|---|
| Name | Quality Control Engineering Lab Co-ordination Meeting |
| Purpose | Co-ordinate the inspection of samples submitted to the Engineering Lab for quality audit. Determine the corrective action to be taken in case of discrepancies. |
| Chairman | Quality Control Manager or Assistant Quality Control Manager |
| Members | Assistant Chief Inspector, Assembly and Process Inspection and Test<br>Chief Test Engineer or Project Engineer, Jet and Vibration |

| | |
|---|---|
| Name | Quality Control Co-ordination Meeting |
| Purpose | Discuss any special quality problems and co-ordinate requirements with the Air Force, Navy, and Pratt and Whitney. |
| Chairman | Quality Control Manager |
| Members | Air Force Quality Control Representative<br>Navy Inspector of Material Representative<br>Pratt and Whitney Resident Inspector<br>Assistant Quality Control Manager<br>Chief Inspector<br>Assistant Chief Inspectors |

BI-WEEKLY

| | |
|---|---|
| Name | Diesel Corrective Action Committee |
| Purpose | Discuss corrective action to be taken on repeat items concerned with diesel equipment. |
| Chairman | Factory Manager |
| Members | Manufacturing<br>Master Mechanic<br>Layout Engineer<br>Supervisor, Diesel Fuel Pumps<br>Engineering<br>Senior Project Engineer, Drafting (Diesel)<br>Quality Control<br>Assistant Quality Control Manager as required<br>Quality Control Supervisor (Quality Analysis)<br>Inspection Foreman (Material Review and Salvage)<br>Diesel Inspector<br>Supervisor, Assembly Inspection |

| | |
|---|---|
| Name | Engineering Change Committee |
| Purpose | Review, co-ordinate, and approve all changes on all products |
| Chairman | Supervisor, Engineer, Change Group |
| Members | Production Engineering representative<br>Production Engineering Co-ordination representative<br>Quality Control Supervisor (Quality Analysis)<br>Aircraft Engine and Burner Ignition representative<br>Assistant Supervisor, Electrical Connectors<br>Assistant Supervisor, Industrial Products<br>Assistant Supervisor, Service Engineering<br>General Supervisor, Technical Services<br>Supervisor, Costing and Pricing<br>Assistant Supervisor, Price Control |

| | |
|---|---|
| Name | Joint Insurance Committee |
| Purpose | 1. Allow Union Representatives to present claims to the committee concerning possible improper administration and payment of claims.<br>2. Provide and revise literature to the employees to further their understanding of the Group Insurance Plan. |
| Chairman | None |
| Members | Division Representatives<br>Director of Industrial Relations<br>Nurse, Supervisor<br>Union Representatives<br>Two committeemen as assigned |

MONTHLY

| | |
|---|---|
| Name | New Products Committee |
| Purpose | 1. Investigate new products and/or ideas conceived and submitted by Scintilla employees and outside sources.<br>2. Justify the need for a detailed market analysis and/or preliminary engineering investigation. |
| Chairman | Chief Engineer, Reciprocating Ignition |
| Members | Director of Engineering<br>Chief Engineer, Research<br>Staff Assistant to the General Manager<br>Sales Manager<br>Assistant Sales Manager<br>Service Manager<br>Factory Manager |

| | |
|---|---|
| Name | Corrective Action Committee |
| Purpose | Discuss corrective action to be taken on repeat items which result from the findings of the Material Review Board. |
| Chairman | Factory Manager |
| Members | Manufacturing<br>Assistant Factory Manager<br>Factory Superintendents<br>Others as required<br>Engineering<br>Material Review and Corrective Action Project Engineer<br>Chief Engineers as required<br>Quality Control<br>Assistant Quality Control Manager<br>Quality Control Supervisor (Quality Analysis)<br>Chief Inspector<br>Inspection Foreman (Material Review and Salvage )<br>Air Force<br>Quality Control Representative |

| | |
|---|---|
| Name | Billing Committee |
| Purpose | Co-ordinate with Production Control the four-month forecast in relation to plant capacity and capabilities. |
| Chairman | Factory Manager |
| Members | Production Control Manager<br>Production Scheduling Supervisor<br>Assistant to Sales Manager |

| | |
|---|---|
| Name | Building and Maintenance Co-ordination Committee |
| Purpose | Co-ordinate the functions of departments concerned with building and maintenance problems. |
| Chairman | Assistant Factory Manager |
| Members | Plant Engineer<br>Division Security Officer<br>Supervisor of Real Estate and Construction<br>Process Chemist<br>Supervisor of Process and Supply Stores |

| | |
|---|---|
| Name | Scrap and Waste Disposal Committee |
| Purpose | Investigate and improve methods of collection, segrogation, and disposal of scrap and waste materials. |
| Chairman | Assistant Factory Manager |
| Members | Process Chemist<br>Supervisor of Process and Supply Stores |

Name — Sales and Service Committee on Releases
Purpose — Analyze the releases to stock. Ensure balances are adequate for anticipated requirements. Take appropriate action as required.
Chairman — Representative of Industrial Products
Members — Supervisor Trade Sales, Service
Supervisor Industrial Products, Sales
Assistant Supervisor Industrial Products, Sales
Assistant Supervisor, Spare Parts

MONTHLY - AS REQUIRED

Name — Office Furniture Committee
Purpose — Investigate office needs in regard to furniture requirements and determine the best equipment at the most economical price.
Chairman — Assistant Purchasing Agent
Members — Advertising Manager
Division Security Officer
Chief Field Engineer
Assistant Service Manager

QUARTERLY

Name — Joint Apprenticeship Committee
Purpose — 1. Consider problems relating to the effective operation of the Apprenticeship Standards and see that the Apprenticeship Standards as set forth therein are properly administered.
2. Have access to all records maintained of the apprentices' attendance and work assignments; and, in consideration of such matters, make recommendations to the supervisor of the apprentices.
3. Hear and adjust all differen es pertaining to the apprentice and employer when these differences have not been settled satisfactorily by the apprentice supervisor.
Chairman — Director of Industrial Relations
Members — Division
Superintendent, Toolroom
Factory Supervisor, Experimental Manufacturing Department
Union
President
Toolroom representative
Experimental Department Representative

| | |
|---|---|
| Ex-officer | Executive Secretary - Training Supervisor |
| Name | Bendix Quality Control Committee |
| Purpose | Interchange quality control and inspection information among various divisions of the Corporation. |
| Chairman | Rotating chairman as designated by the Vice President and Group Executive. |
| Members | Quality Control Manager, Scintilla Division<br>Quality Control representatives of other divisions of the Corporation. |

AS REQUIRED

| | |
|---|---|
| Name | Executive Meeting |
| Purpose | Discuss matters of a broad-scoped nature affecting the Division and its abilities to perform its functions and objectives in an efficient and effective manner. |
| Chairman | General Manager |
| Members | All personnel reporting directly to the General Manager |
| Name | Reliability Committee |
| Purpose | 1. Plan and establish quality control and service procedures to cope with the "weapons system concept" and to comply with reliability requirements of government and customer specifications.<br>2. Initiate plans to ensure compliance with future reliability requirements.<br>3. Establish procedures to ensure adequate flow, evaluation and utilization of feedback information. |
| Chairman | Staff Assistant to the General Manager |
| Members | General Manager<br>Comptroller<br>Director of Sales, Service, and Advertising<br>Director of Engineering<br>Sales Manager<br>Service Manager<br>Quality Control Manager<br>Chief Inspector<br>Supervisor, Specifications and Standards Section |
| Name | General Inventory Committee |
| Purpose | Determine the procedure for the taking of the annual inventory, including the establishment |

of the following items: time of inventory, what items to be included, inventory supervisors, number of personnel required, what operations will be in progress during the inventory period, and number of tickets required.

| | |
|---|---|
| Chairman | Comptroller<br>Factory Manager (Co-chairman) |
| Members | Production Manager<br>Factory Superintendents<br>Supervisor of Scheduling and Planning<br>Supervisor of Contract Closing<br>Supervisor, Costing and Pricing<br>Staff Assistant to Divisional Comptroller<br>Supervisor of Service Repair<br>Assistant to Sales Manager<br>Quality Control Manager<br>Chief Inspector<br>Traffic Manager |
| Remarks | Two or three meetings held prior to taking of annual inventory |

| | |
|---|---|
| Name | Pension Board of Administration |
| Purpose | 1. Responsible for verifying service credits, reviewing eligibility for benefits, and receiving and acting on applications.<br>2. Responsible for procedures for reviewing applications for pensions.<br>3. Provide procedures for making appeals to the Board.<br>4. Review general information about the plan for dissemination to employees. |
| Chairman | Union representative |
| Members | Union<br>Two union representatives<br>Division<br>Corporation Director of Industrial Relations (absent)<br>Director of Industrial Relations<br>Comptroller |

| | |
|---|---|
| Name | Packaging Committee |
| Purpose | Formulate adequate packaging methods and procedures to comply with Government specifications. |
| Chairman | Representative from Government Order Section, Sales Department |

| | |
|---|---|
| Members | Quality Control Supervisor (Special Controls)<br>Packaging Co-ordinator, Shipping Department<br>Senior Project Engineer, General Materials, Engineering<br>Air Force Representative as required. |
| Name | Educational Assistance Committee |
| Purpose | Pass on eligibility of employees requesting participation in the program. |
| Chairman | Director of Industrial Relations |
| Members | Training Supervisor<br>Comptroller |
| Name | Standards Committee |
| Purpose | Consider and release all engineering standards which may include, directly or indirectly, standards applicable to other departments. |
| Chairman | Project Engineer, Senior, Engineering Department |
| Members | Quality Control Manager or Assistant<br>Master Mechanic or Assistant<br>Other departments as required by product |
| Name | Engineering Library Committee |
| Purpose | 1. Review requirements and purchase necessary technical books and publications required for the Engineering Department.<br>2. Maintain investigative files for engineering projects. |
| Chairman | Chief Engineer, Research |
| Members | Chief Test Engineer<br>Chief Metallurgical Engineer<br>Chief Engineer, Jet |
| Name | Scintilla Facilities Brochure Committee |
| Purpose | Establish a brochure enumerating the capabilities of the Scintilla Division, defining therein the Division's basic aims and policies. In addition, foster better relations with suppliers, vendors, customers, and prospective employees. |
| Chairman | Advertising Manager |
| Members | Quality Control Manager<br>Service Manager<br>Sales Manager<br>Training Supervisor<br>Plant Engineer |

| | |
|---|---|
| Name | Vendor Seminar Committee |
| Purpose | Develop a program to foster good relations with material suppliers. Provide information on how the materials are utilized in order to develop an awareness of the problems at Scintilla in the minds of the vendors. |
| Chairman | Purchasing Agent |
| Members | Assistant Purchasing Agent<br>Advertising Manager<br>Training Supervisor<br>Division Security Officer<br>General Supervisor Service Sales |

| | |
|---|---|
| Name | Scrap and Rework Committee |
| Purpose | Evaluate high scrap and rework within departments.<br>Exert special attention on troublesome items.<br>Initiate recommendations for improved procedures, methods, or request engineering changes. |
| Chairman | Assistant to Factory Manager |
| Members | Factory Superintendents<br>Factory Manager<br>Additional members to be designated |
| Remarks | Committee is in formative stage. |

1.3 Discussion of Present Organization and Proposed Changes. It is a known fact that the subject of organization is of major importance to a company and that strong feelings can be readily developed by a failure to fully recognize the true value of various positions. However, the following approach has been taken, realizing the serious limitations placed on our study by the "scope" of this report.

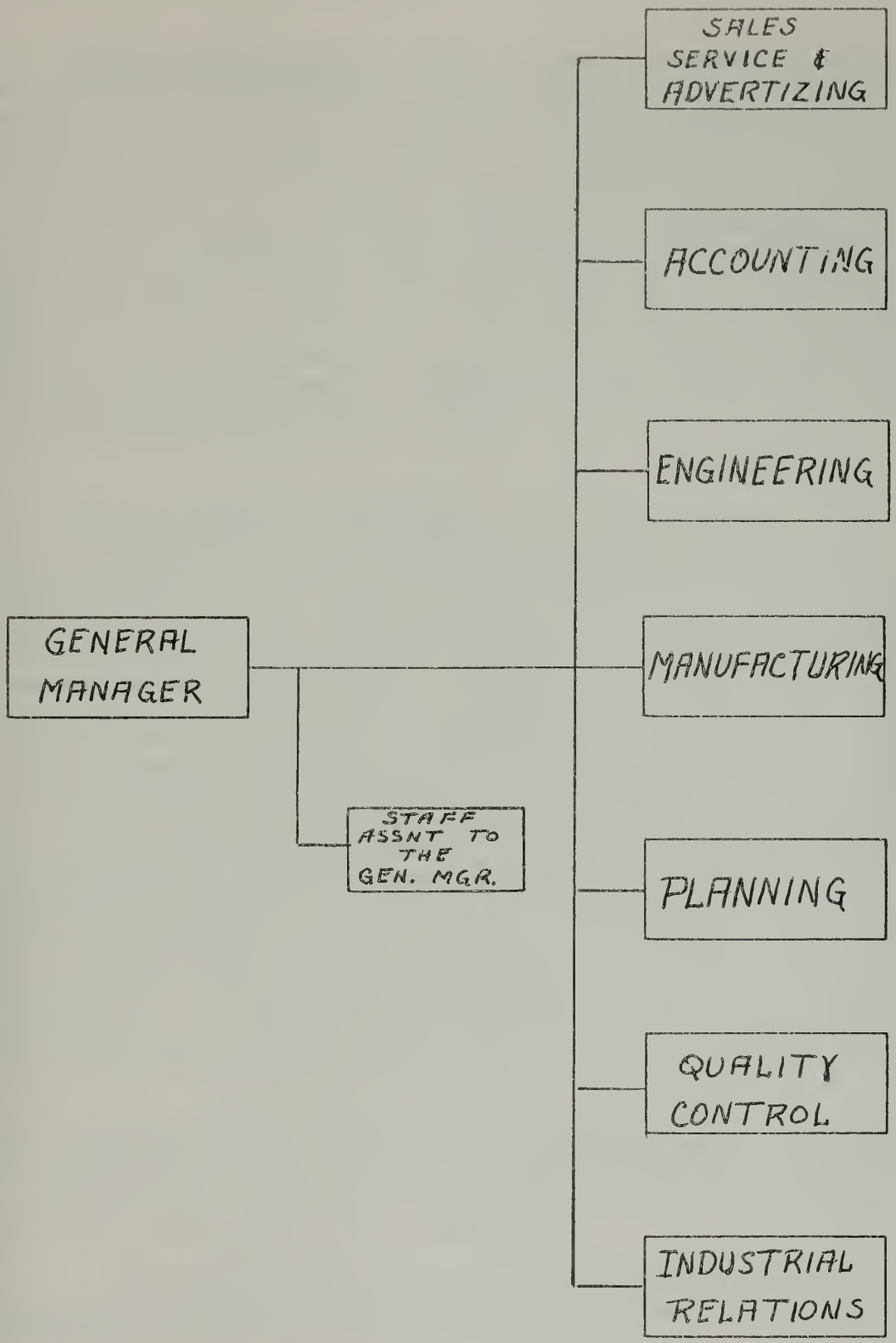
The existing organization has been analyzed in relation to the overall objectives of the Division. This analysis yielded data that conflicted in certain areas with what is generally considered to be an ideal organization structure. The recommendations made in this report are based on bringing the present organization to this ideal state. By definition this goal is never achieved; however, it is believed that the establishment of this goal is an end in itself and can over the years result in substantial gains for the company. The fact that personalities and other conditions may prevent immediate acceptance of any particular recommendations does not necessarily affect its long run usefulness.

The presentation of this section of the report will take the form of a detailed analysis of individual departments and top management relationships. Following this section, a summary of recommendations will be included.

1.31 General Manager and Staff Assistant to the General Manager. The general administration and operation of the Division appears to be smooth, effective and efficient. However, it is the considered opinion of the study group that the General Manager's span of control of eleven is excessive. The efficient manner in which it is being conducted is believed due to the fact that the General Manager has delegated authority to a large degree; yet, retaining the responsibility for final decision commensurate with the importance of the problem. This, in essence, provides him with a high degree of "completed staff work" for his final action. Considerable attention has been directed towards reducing his span of control yet remaining compatible with accepted modern organizational concepts. As discussed in other chapters, the Plant Property Department, Traffic Department, and the Plant Protection Department have been reassigned organizationally and a new PLANNING DEPARTMENT has been created. This lowers the General Manager's span of control to seven. Chart 1-9 illustrates the proposed Division organization.

It is recognized that certain additional factors will have a bearing on the feasibility and phasing of implementation of many of the proposed changes. They are proposed, however, in the hope that they will be used as goals to work toward as time and circumstances permit.

The position of the Staff Assistant to the General Manager is considered to be a very necessary and valuable one. It appears to be operating in an efficient and effective manner, performing specially assigned managerial and engineering projects. This position provides an excellent avenue of executive development and it is recommended that the use of the position be retained. Presently, the Quality Control Manager reports directly to this position. It is assumed that this functional arrangement was made in the sense of a special project; hence, temporary in nature. Based on this assumption, it is recommended that the Quality Control Manager report directly to the General Manager upon completion of the currently assigned special project.




DIVISION ORGANIZATION CHART

(PROPOSED)

CHART 1-9

1.32 Traffic Department. This section is concerned with only the relationship of the Traffic Department to the other organizational units of the Division and does not consider the organization of the department itself. At the present time the Traffic Manager reports directly to the General Manager. One of the objectives of the ideal organization for the Division is to reduce the span of control for the General Manager. This objective is a primary consideration in the recommendation that the traffic function be transferred to the Manufacturing Department and no longer report directly to the General Manager. It is realized that at the present time the General Manager actually spends a very small proportion of his time supervising this function. Because of this fact, it is not felt necessary to make this change until such time as is convenient for the Division.

1.33 Plant Property Department. The organization of the Plant Property Department includes certain functions, involving capital assets, that require compliance with basic corporation policies. This also is believed to be true to a degree of the Plant Engineering Department. Investigations have indicated a lack of clear demarcation of responsibility between the two departments. Further, the basic responsibilities of each are so allied and interrelated, e.g., each performs specific types of maintenance, alterations, movements of facilities, modification of facilities, etc., that considerable co-ordination is required. In addition, the departments make use of similar job categories. It is recognized that certain of the functions of the Supervisor, Plant Property Department require direct co-ordination with the General Manager and Corporation officials. However, it is believed that this requirement is not as time consuming as that spent with the Plant Engineering Department. It is believed that considerable benefit could be derived for the reasons discussed above, to combine the functions of the Plant Property Department with those of the Plant Engineering Department at the earliest practicable date.

An important function of the Building and Maintenance Committee is to ensure a co-ordinated effort between these two departments. If these departments are combined, as recommended, consideration should be given to the feasibility of eliminating this committee.

Attention is referred to the new functional description of the Plant Engineering Department where the proposed reassignment of functions are defined.

1.34 Manufacturing Department. The Manufacturing Department performs its assigned functions in an effective manner under the existing organizational structure. However, in contrast with an ideal situation, many possibilities for improvement have been noted. These possibilities have been studied and a number of recommendations have been prepared. These recommendations tend to minimize difficulties that are considered to exist in the department and the Division as a whole. In general the recommendations stress action in the following areas:

A. Increase overall planning.
B. Decrease the span of control for specific executives.
C. Minimize the present emphasis on daily problems by top executives, freeing them for more important responsibilities.
D. Co-ordinating many sections or departments that perform the same or similar functions in order to reduce duplication and increase overall efficiency.

In order to arrive at an organizational state that accomplishes the previous listed general recommendations, the following changes are recommended:

I. Assistant Factory Manager. The existing position is not considered a true assistant. If effect, this position is a separate activity in which the incumbent possesses the necessary characteristics to be the second in command of the department and, for that reason, received the title. The first major recommendation is in this area and encompasses the following action:

A. Remove the functions of janitors, matrons, inside trucking, scrap disposal, ground, and instrument maintenance from the existing responsibilities of the Assistant Factory Manager. Redesignate the remaining functions under the title Manufacturing Superintendent, Processes. Assign the functions removed from this section to the Plant Engineer.

B. Co-ordinate the following activities under the control of one man, the newly created position of Assistant Factory Manager:

1. Manufacturing Superintendent, Assembly
2. Manufacturing Superintendent, Connectors
3. Manufacturing Superintendent, Machining
4. Manufacturing Superintendent, Second Shift
5. Manufacturing Superintendent, Processes

This new position is one of major importance and under the Factory Manager, holds the authority and responsibility for all direct manufacturing activities.

II. Traffic. As previously stated in Section 1.32, it is recommended that this department be relocated in the Manufacturing Department. Specifically, the basic functions of this section -- shipping, receiving, and packaging -- are to be assigned to the Production Control Section.

III. Plant Engineering. In the present organization this function has been broken down into many sections throughout the plant. The recommendation entails combining all the separate entities into one section. The following steps should be taken:

A. Relocate the Plant Property Department to the Manufacturing Department (see 1.33) under Plant Engineering.

B. As previously stated under the discussion of the Assistant Factory Manager, relocate the functions of janitors, grounds, instrument maintenance, and related duties under Plant Engineering.

IV. Production Control. This activity has been changed in order to ensure that its primary purpose is achieved in the most efficient manner. The recommended function of Production Control ensures material, plans, and tools are available for carrying out planned activities and initiates authorizations for work, continually determining if standards are being adhered to and advising cognizant supervisory personnel of significant variances for necessary corrective action. The duties removed from the existing position of Production Manager are as follows:

A. Scheduling.
   1. Master Scheduling - To the Planning Department (to be discussed).

2. Detailed Scheduling - To Production Scheduling (to be discussed).

B. Tabulating - To Production Scheduling.
C. Inventory Control - To Production Scheduling.

V. Manufacturing Engineering. It is recommended that a new section titled Manufacturing Engineering be created. This section is basically a remodeling of the existing section of the Master Mechanic. However, certain modifications are felt necessary. These changes are as follows:

A. Remove the functions of Methods Engineering and Layout from the responsibilities of the Master Mechanic.
B. Relocate these planning functions in the Planning Department. The concept of a Planning Department is new and will be discussed in Section 1.35.

VI. Productions Standards and Estimating. Relocate this section in the newly created Planning Department (1.35).

VII. Production Scheduling. The functions assigned to this newly created section were formerly performed by the Production Manager and are as follows:

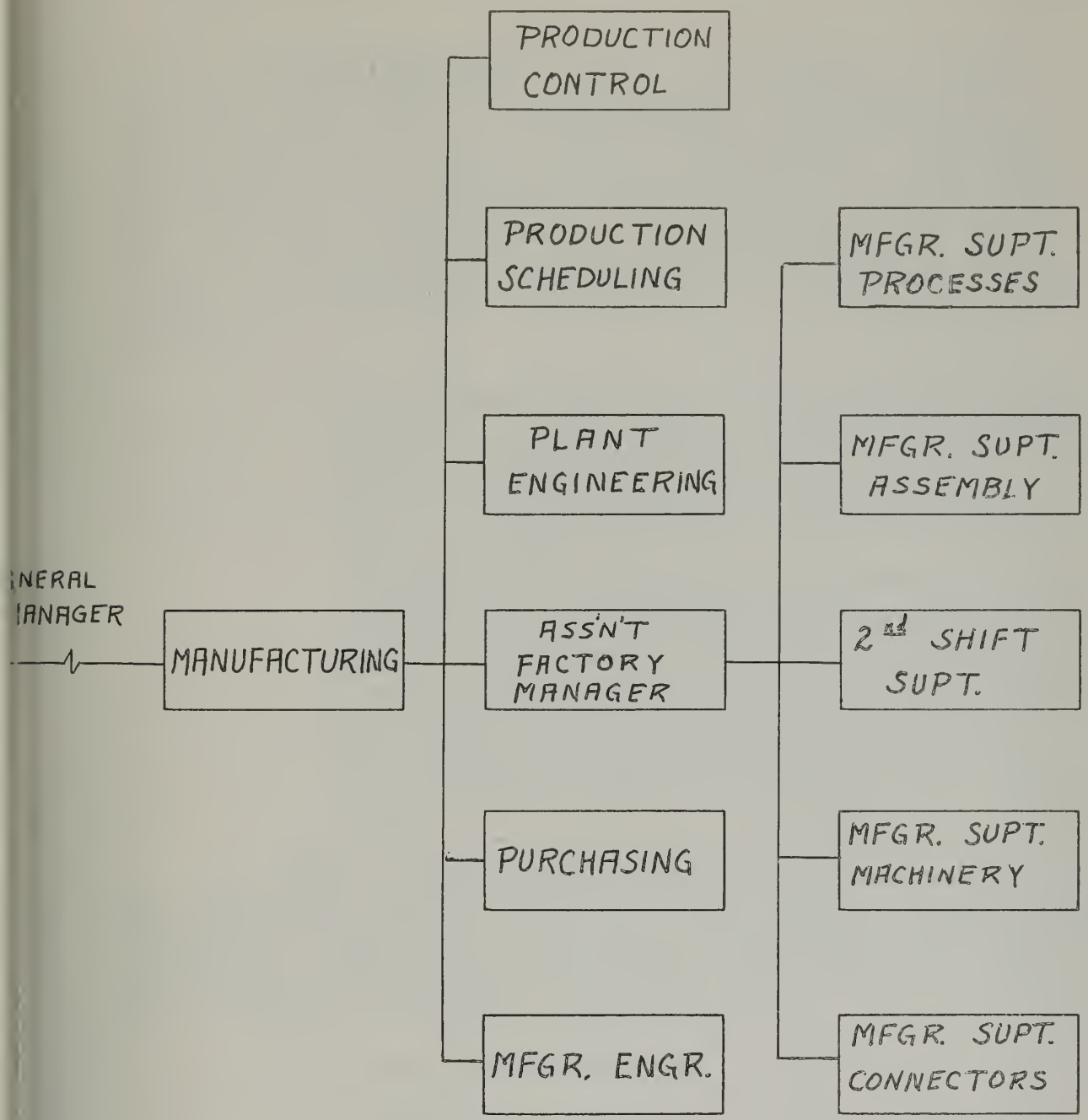
A. Detailed Scheduling (not including master scheduling).
B. Tabulating.
C. Inventory Control.

The basic reason for the splitting up of the responsibilities of the Production Manager is to separate the important control function from detailed scheduling. Furthermore, it is hoped that the increased concentration on scheduling will result in manufacturing economies.

VIII. Summarization. In general the major organizational recommendations entail the removal of planning (Master Scheduling), Methods Engineering, Layout, and Standards from the Manufacturing Department, relocating them in a new department titled Planning (see Section 1.35).

The relocation of the duties outlined in the preceding paragraphs bring to light additional changes that are

considered extremely desirable -- that of combining all direct manufacturing sections under a common supervisor and the creation of a new section called Production Scheduling. The proposed Manufacturing Department organization is shown in Chart 1-10. This structure has reduced the span of control of the Factory Manager from eleven to six, stressed the planning aspects of the entire plant by the creation of a new department (Planning), consolidated similar functions under one activity, and removed the source of many daily problems from the immediate cognizance of upper management.




MANUFACTURING DEPARTMENT

(PROPOSED)

CHART 1-10

1.35 Planning Department. In the investigation of the present organization it was determined that the area of planning, both within the Manufacturing Department and between departments, was in need of improvement. This problem was carefully studied and resulted in a recommendation of creating a new department called Planning. Recognizing the fact that the creation of a new department is a major step in any reorganization and must be justified by an increase in overall plant efficiency, it is considered necessary to list the facts that were used to arrive at this decision.

A. The intermediate-range planning functions are buried in a most complex department and their contributions or suggestions are in daily conflict with may other important problems.
B. Other departments, such as Quality Control, are in need of standards and methods engineering attention.
C. Good co-ordination between departments, such as Engineering and Manufacturing, requires an outside activity to establish a realistic master schedule and, in addition, to provide the same assistance in the areas of new products, estimating, and engineering changes.
D. The removal of the planning functions would not adversely affect the ability of the Manufacturing Department to accomplish its objectives.

The establishment of the Planning Department entails the removal of certain responsibilities from the Manufacturing Department and placing them under two sections in the Planning Department. These new sections are titled Industrial Engineering and Pre-Planning. The composition of these sections are as follows (see Chart 1-11):

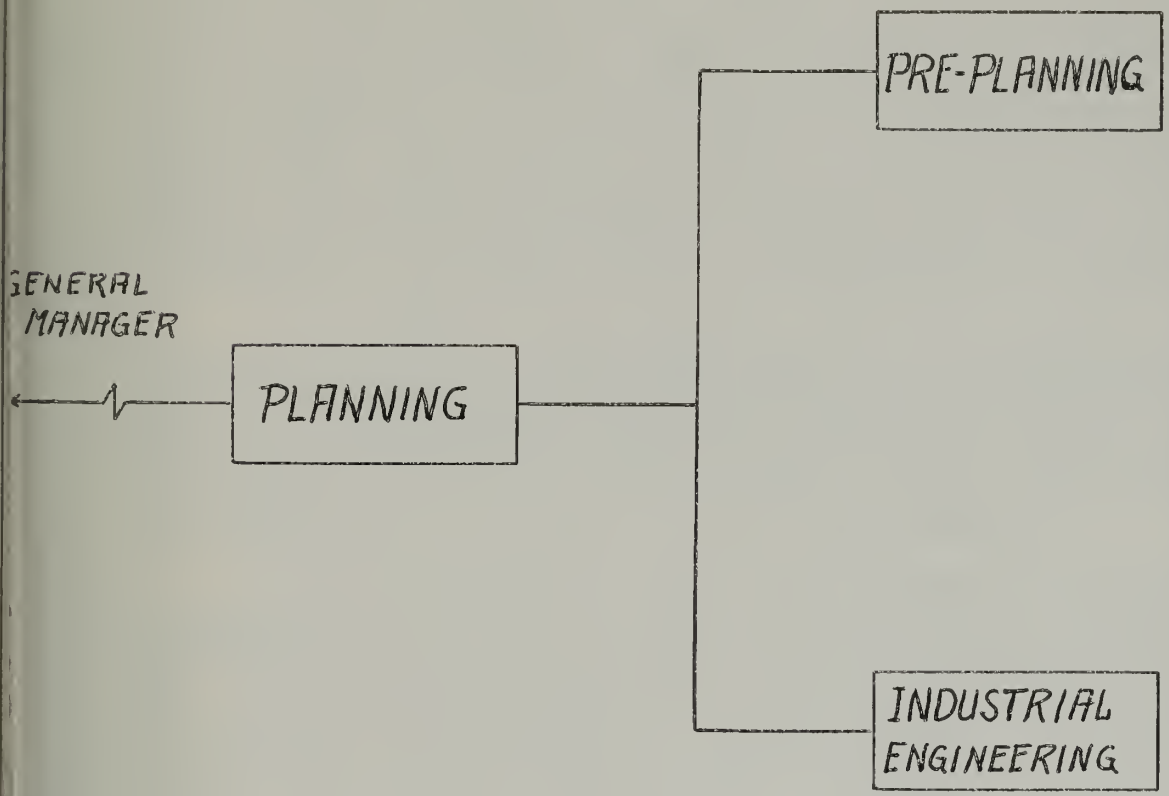
A. Industrial Engineering.

1. Methods Engineering (formerly under the Master Mechanic)
2. Layout Engineering (formerly under the Master Mechanic)
3. Production Standards (formerly in Production Standards and Estimating Section)

B. Pre-Planning

1. Master Scheduling (formerly under the Production Manager)
2. Estimating (formerly in Production Standards and Estimating Section)
3. New Products, Engineering Changes, and Production Analysis (formerly under the Production Manager)

The Planning Department would, in effect, be responsible for intermediate-range planning. It is believed that this function presently is not being performed at maximum efficiency and that the adoption of the proposed organizational change would do much to alleviate this shortcoming. Long-range planning would remain the responsibility of the parent Corporation, General Manager, and top management committees.




# PLANNING DEPARTMENT

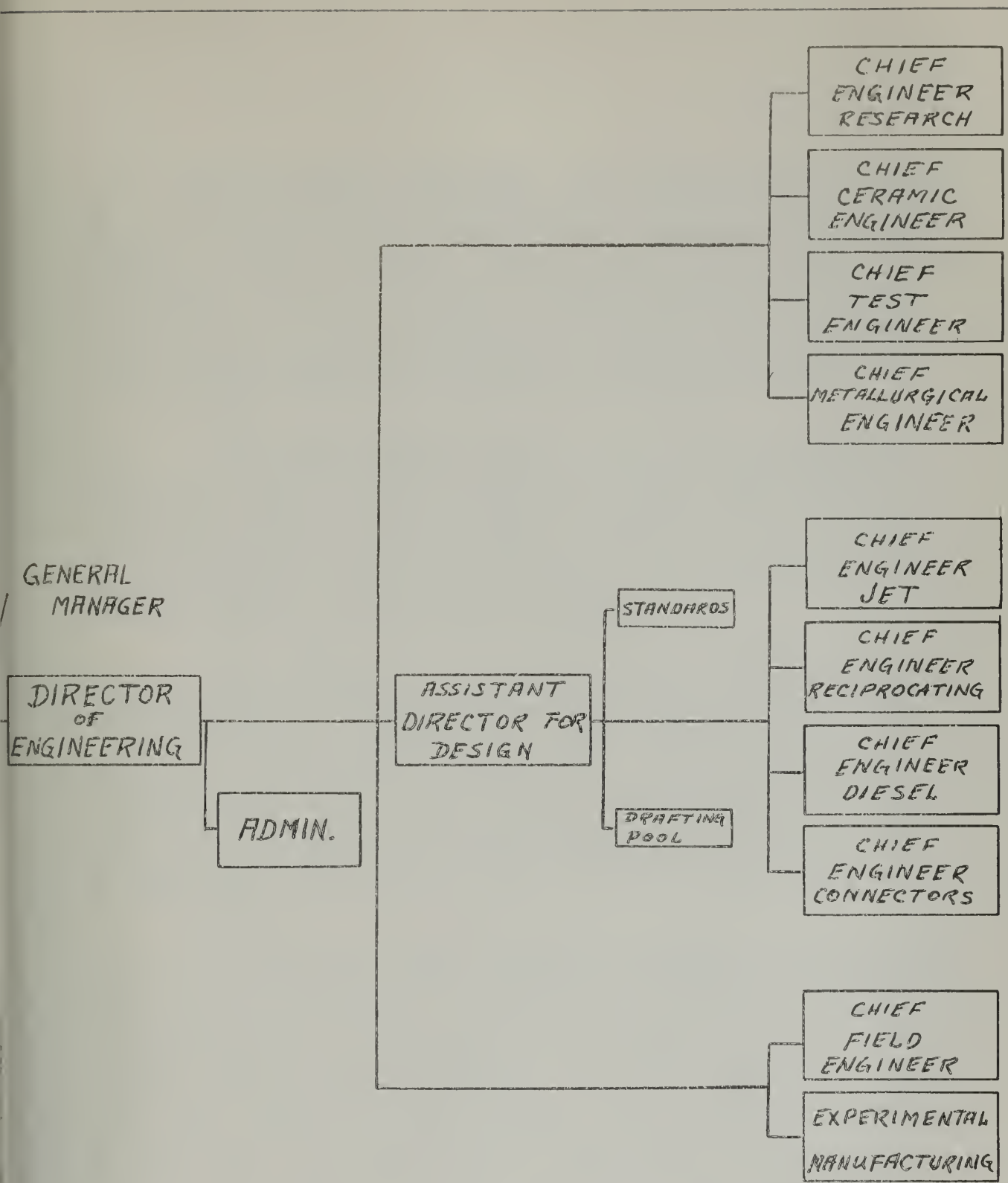
(PROPOSED)

CHART 1-11

1.36 Engineering Department. The present organization is divided into three departments: (1) Department 90-Design; (2) Department 91-Laboratories; and (3) Department 92-Experimental Manufacturing. The Director has a total span of control of eleven. This formal span of eleven is actually administered by an informal span of seven or eight, the remainder reporting to the Assistant Director of Engineering for immediate supervision. The areas that report to the Assistant Director have been assigned commensurate with his personal specializations and qualifications. Since the studies of this survey do not support the feasibility of reducing the total number of major sections in the department, it is recommended that the span be reduced by dis-establishing the position of Assistant Director of Engineering and establishing a new position - Assistant Director for Design (Chart 1-12). The creation of such a position will provide greater co-ordination within the design departments. It is not believed that Departments 91 and 92 require co-ordination in addition to that which can be afforded by the Director.

In order to place greater importance on the standards function and to establish a means for continued yet closer co-ordination with the sections of the design department, it is recommended that it be separated from its present position in the General Administration Section and assigned to a separate staff position as shown on Chart 1-12. The drafting pool is considered in the same category.

It is recommended that the position of the General Administration Section be rewritten and relocated organizationally so as to report direct to the Director of Engineering. It is considered that such action will better facilitate his serving the Director as well as co-ordinating the new functions recommended for his acquisition. The new position description should include the following functions: records and blueprint distribution, personnel, specifications and technical writing, financial matters, library, and job progressing. For further detail discussion, refer to the appropriate section in Chapter VIII, Engineering.




# ENGINEERING DEPARTMENT

(PROPOSED)

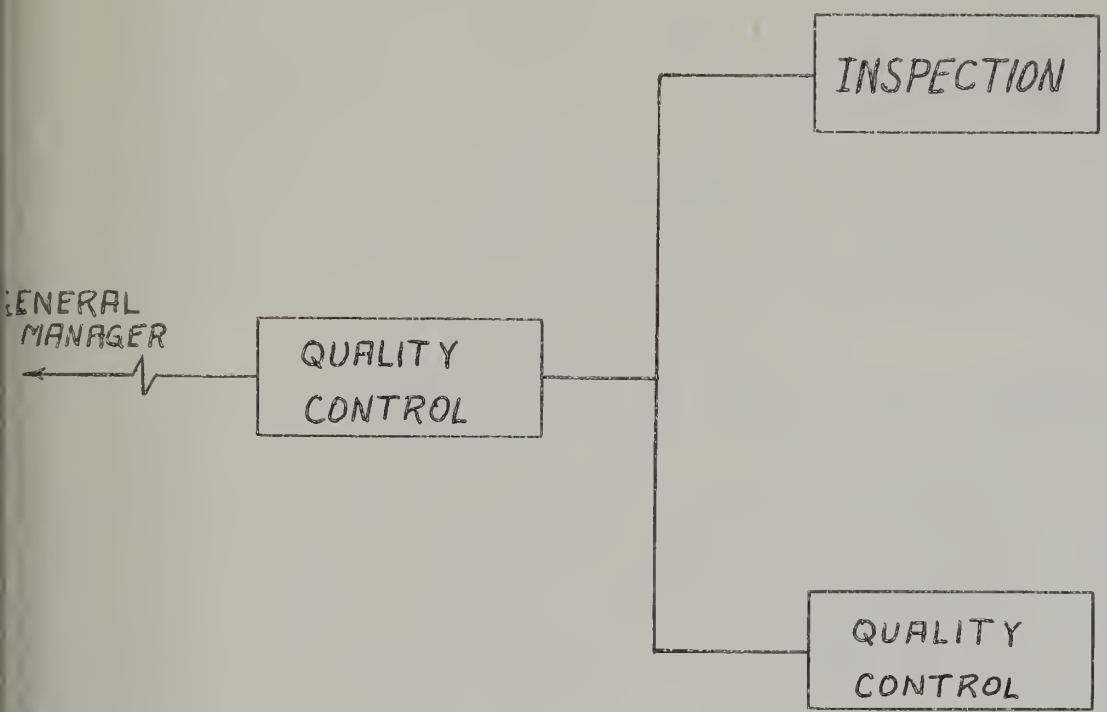
CHART 1-12

1.37 Quality Control Department. This department is composed of two major functional areas, quality control and inspection. Many of the procedures followed in the department are established by outside agencies, such as the U.S. Air Force. Consequently, the Quality Control Manager is not in a position to delegate as much authority and responsibility to his subordinates as has been accomplished in several of the other departments. His subordinates do, however, have considerable leeway in determining the methods of accomplishing many of the functions within the established policies.

Two organizational factors with this department appear to warrant consideration for future study. The first is the fact that the Quality Control Manager now reports to the Staff Assistant to the General Manager. It is anticipated that this arrangement will be corrected in the future by the Division and is felt necessary only to indicate that in the proposed organization, the Quality Control Manager reports directly to the General Manager.

The other area of consideration is the Assistant Quality Control Manager. He and the Quality Control Manager appear to have an excellent "team" working relationship at the present time. There may be a small amount of confusion as to whem something should be handled by the Assistant or when it is necessary for the Manager to make the decision. Although there are no exact rules to indicate what should be presented for decision to the Assistant and what to the Manager, the subordinates generally appear to know what to do in each case, commensurate with the level of importance of the decision.

One of the objectives for the proposed ideal organization is a reduction (but only when it appears advantageous to do so) in the number of assistants throughout the Division. This may be possible to do in the future in this department by introducing a new function to co-ordinate the three quality control supervisors and disestablishing the function of Assistant Quality Control Manager. It is felt that this would place more emphasis on the quality control function in relationship to the inspection function. The Quality Control Manager would then have only two subordinates reporting directly to him, the Chief Inspector and the proposed supervisor of the quality control functions. This recommendation is not intended to be a necessity requiring immediate action, but one which should be considered for the future when the opportunity arises.




QUALITY CONTROL DEPARTMENT

(PROPOSED)

CHART 1-13

1.38 Accounting Department. The organization of the Accounting Department is controlled to a certain extent by the policies of the Corporation. Although the Corporation does not indicate the exact type of organization to use, it does, by establishing policies and determining what information and reports are required, determine most of the functions which are necessary and thus influence the type of organization. The Comptroller does, however, have the responsibility of organizing his department in such a manner to meet the requirements of the Corporate and Divisional policies. The amount of authority which the Comptroller delegates to his subordinates is also influenced by the fact that his duties and responsibilities are determined by the Corporation. Even though the supervisors reporting to the Comptroller feel that they have been given almost complete freedom in the direction, control, planning, and co-ordination of their individual section, this authority is not as great as it appears. The functions are well established and the degree of freedom in most cases is very limited. The methods of accomplishment are determined to a certain extent by the supervisors; but the actual work to be accomplished is not.

The Accounting Department is the only department of the Division which does not have its own organization chart. Even though the members within the Department may know how it is organized and to whom they report, an organization chart would aid in this understanding; not just by those within the Department but by outsiders as well. The Divisional organization chart is not revised often enough to give an accurate picture of an individual department, nor does it go into the necessary details as do the organization charts presently being used by all other departments of the Division. Consequently, it is recommended that an organization chart be prepared for the Accounting Department and that it be maintained in an up-to-date status at all times.

Of the nine major functions reporting to the Comptroller, three have the title "Staff Assistant to the Divisional Comptroller". Having three staff assistants for a department head appears to be rather unusual and not entirely justified. However, the main topic of discussion seems to be the actual title used, rather than the functions assigned to the individuals. Each staff assistant has permanently assigned functions in a manner similar to any supervisor in the Department. The only apparent differences are that they do not have a number of personnel reporting to them

and that they may be given special assignments more readily than the others. It is recommended, however, that the Division make a complete study of these three positions with the viewpoint of combining some of the functions at this level and incorporating some of the functions into the remaining areas in the Department. It is felt that by so doing, it will be possible to eliminate two of the assistants to the Comptroller, transfering these functions to the General Accounting group. It is further recommended that the functions of billing and cost of sales be transferred to the General Accounting group. With this transfer, plus the transfer of the functions of two staff assistants, this group would then have under it all its present duties plus such things as the general ledger, balance sheet, profit and loss statement, sales journal, cost of sales, and billing.

It is not felt that the above changes should necessarily be made immediately. It is proposed that they be made gradually, as various individuals leave the employment of the company or when other opportunities arise. The savings which would result from the proposed reorganization would not warrant immediate change in personnel and their assignments, but should be considered when applicable.

It is not possible for the members of this group, with limited background and time, to analyze the organization of this department to the extent felt necessary. It is believed that such a study should be considered by the Division to ensure that the best possible organization, from the viewpoint of efficiency, economy, and co-ordination, is adopted by this department. The final result may be that the Department will have two major areas, Cost Accounting and General Accounting plus one staff assistant and the Officer Manager mentioned below.

Although presently not a function of this department, the position of Office Manager will be discussed herein, as it is recommended that it be located here and report directly to the Comptroller. This appears to be the normal practice in industrial organizations. It is desirable to point out that the location of the Office Manager as staff to the Comptroller is not intended to imply that he serves in such a capacity only for the Accounting Department; but rather to serve all organizational entities in the Division, using the Comptroller as co-ordinator and supervisor.

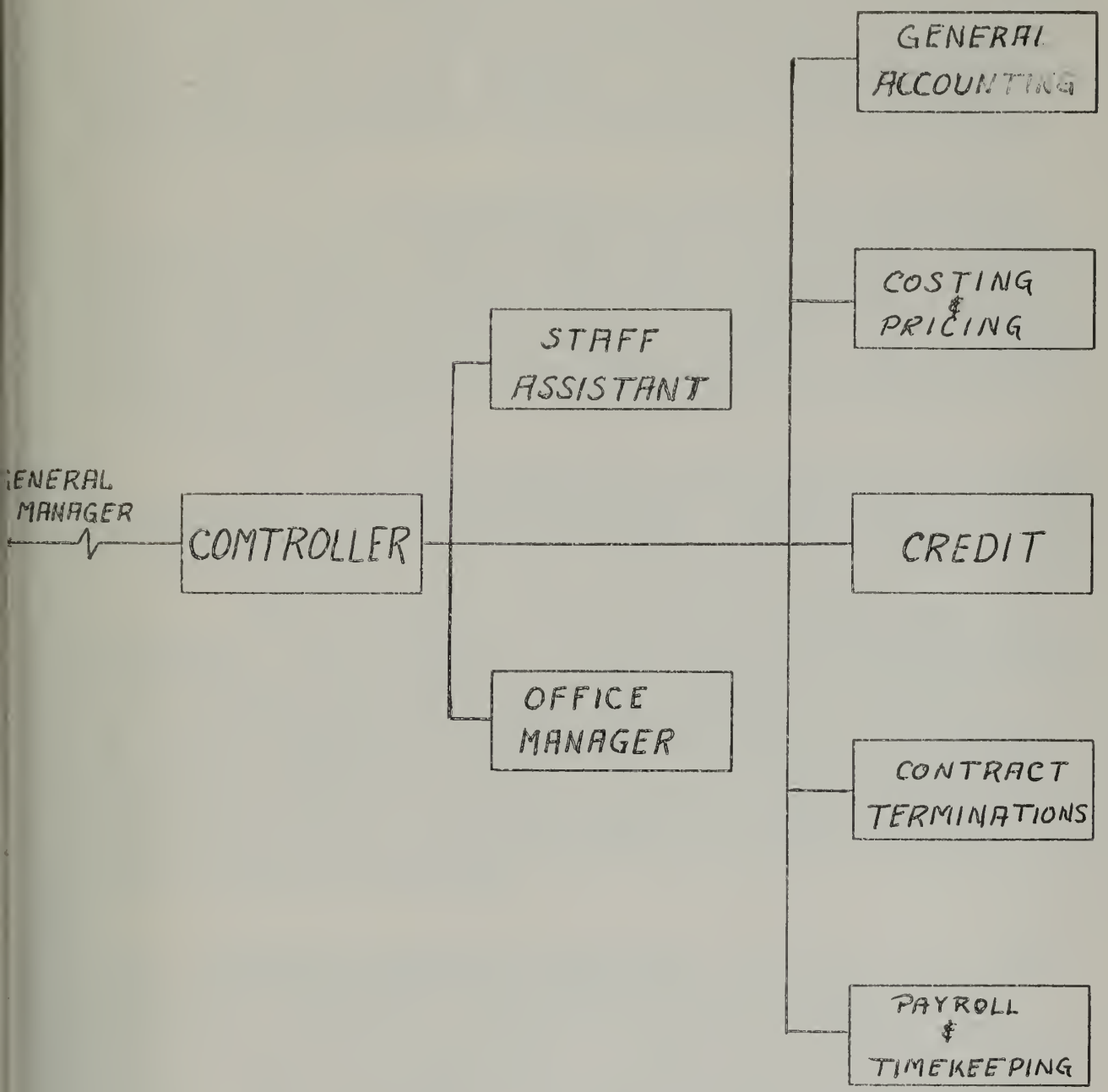
The functions and objectives of an Office Manager

are currently performed on an "as required" basis by the respective department heads. Certain departments perform these functions to a larger degree than others, depending on the importance attached to the problem, availability of personnel, personnel qualifications, and interests. In some departments little if any attention is given to standardization of office methods, systems, forms, etc. Presently there is no one organizational entity responsible for continual review of these procedures as they might affect the operating efficiency and effectiveness of the Division as a whole. Also lacking is the assignment of the function for constant study and review of organizational structure and concepts for the purpose of fostering new and effective business practices in order to meet changing conditions.

In view of the apparent lack of a co-ordinated effort in performing the above-discussed important functions, it is recommended that an Office Manager section be established. It is further recommended that the head of such section be well qualified in the fields of organization and office methods. Functions assigned to the section supervisor should include the following:

1. Conduct surveys, review proposed changes, and make recommendations for improvements of departmental organization structure.
2. Prescribe uniform methods for the performance of the Division's office work (as assigned ) whenever such uniformity will significantly increase the effectiveness or decrease the cost of such work.
3. Responsible for standardization of office forms, procedures, and equipment.
4. Responsible for all communications systems, procedures, and equipment (mail, telephone, telegraph, TWX, messengers, etc.).
5. Responsible for maintaining an efficient and effective incoming, internal, and outgoing mail system.
6. Responsible for maintaining and issuing stocks of stationery supplies.
7. Responsible for duplicating, mimeographing, multilithing, etc., for usage in the Division and/or offices.
8. Recommends approval for office furniture, fixtures, and machines.
9. Maintains central files and archive files.
10. Maintains Division manuals, e.g., Organization Manual.

It is reiterated that this office should serve all departments alike. This study group recommends that it be placed under the Accounting Department with the alternate location of under the Director of Industrial Relations.




# ACCOUNTING DEPARTMENT

( PROPOSED )

CHART 1-14

1.39 Plant Protection Department. The organization of this department encompasses many basic responsibilities not allied to its primary responsibilities of plant protection and other security matters. These functions are medical, group insurance, compensation insurance, cafeteria, safety, communications, mail, and office supplies. It is strongly recommended that these functions be divorced from the Plant Protection Department and assigned to the Industrial Relations Department as follows:

1. It is recommended that the Safety Engineer be established as a separate section under the Director of Industrial Relations. This section would include the functions of medical, group insurance, and group compensation. All of these functions are interrelated to a degree and are believed to be Industrial Relation functions by nature. The cafeteria operation is believed to be an employee-relation type of function and it is therefore recommended that it be assigned to the Personnel Section.

2. It is recommended that the functions of communications, mail, and office supplies be combined with the newly recommended section of Office Manager. Detail discussion of the Office Manager's functions are discussed in Section 1.38.

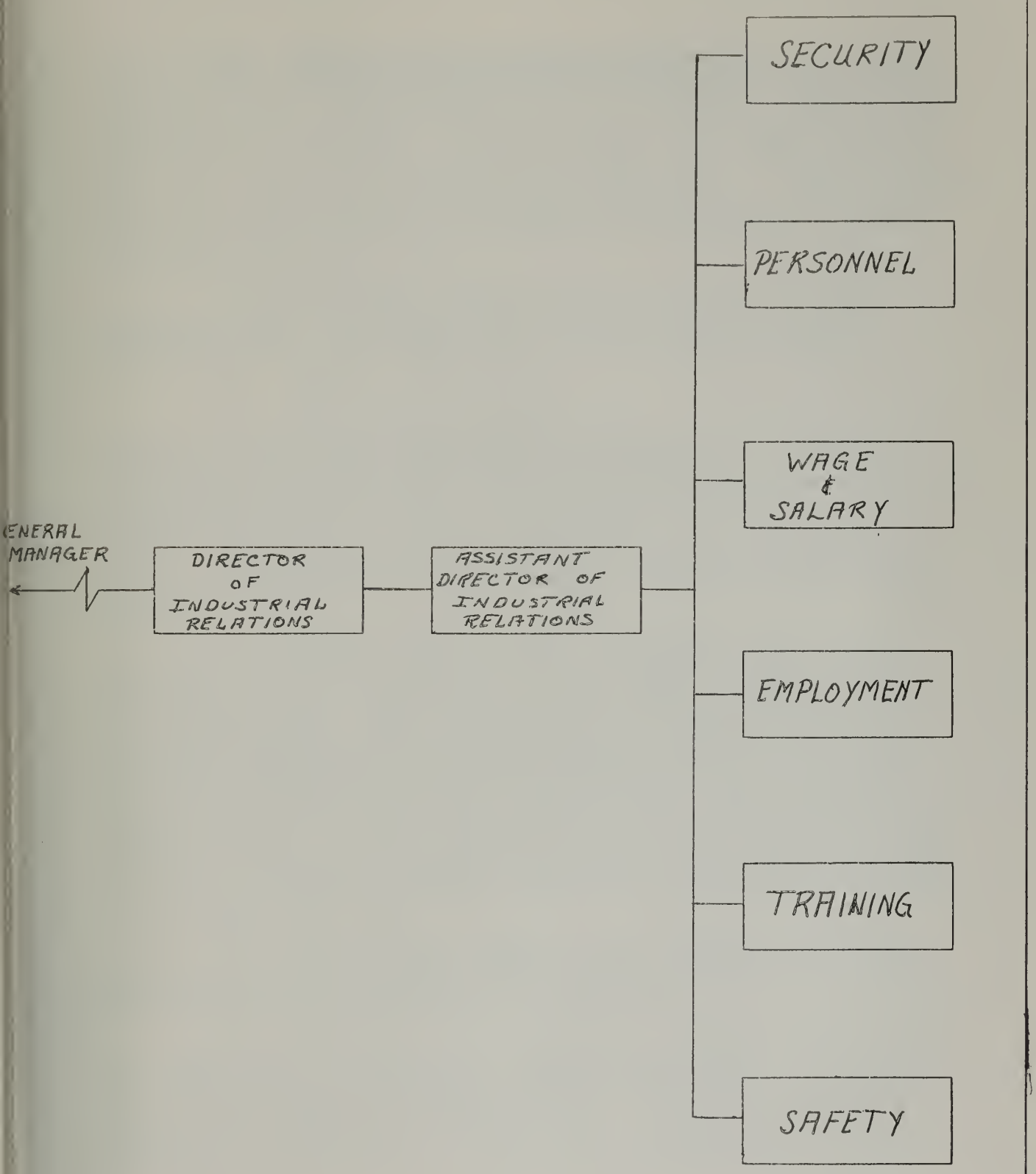
Much attention has been directed toward reducing the span of control where it is considered appropriate and beneficial. In furtherance of this desire, it is recommended that the Plant Protection Department report to the first level of management below the General Manager. In view of the desired co-ordination between the functions of security clearances, personnel records, etc., it is recommended that the Plant Protection Department with its basic responsibilities being Security and Plant Guards, be renamed as the Security Section and organizationally located in the Industrial Relations Department.

1.390 Industrial Relations Department. Section 1.39 recommends the reassignment of certain functions, e.g., medical, insurance, cafeteria, communications, and security to the Industrial Relations Department. Chart 1-15, Proposed Industrial Relations Department, incorporates such recommended changes. The following functional assignments have been recommended for the respective sections:

A. Personnel - Add cafeteria administration.

B. Safety - Establish as a new section with the following primary functions: safety engineering, medical, group insurance, and group compensation.

C. Security - Establish as a new section with the following primary functions: security matters and plant guards.




INDUSTRIAL RELATIONS DEPARTMENT
(PROPOSED)

CHART 1-15

1.391 Sales, Service and Advertising Department. The Sales, Service and Advertising Department performs it assigned functions in an efficient manner and is, in general, cognizant of organizational problems. Investigation of the organizational structure has revealed, however, certain areas where improvements are considered desirable and practicable. These improvements are not considered as being immediately applicable, but should be installed over the years as retirements and other unforeseen conditions occur.

The following functions have been affected by changes. These recommendations and the reasons therefore are as follows: (See Chapter IX for additional data.)

I. Service Department.

A. Trade Sales. Transfer this section in its entirety to the Sales Department, specifically to the District Offices and the Statistical Section as applicable. It is understood that a clear cut distinction has been created between the Sales and Service Departments in this regard; however, the need for this separation is not considered important. Consolidation would promote efficiency and reduce costs.

B. Service Publications. Transfer this section out of the Service Department and reassign it under the responsibilities of the Assistant Sales Manager, Advertising (to be discussed). This activity is presently controlled to a degree by the Advertising Manager. The only important reason for keeping it in the Service Department is the fact that it produces the Service Publications. Investigation revealed, however, that this responsibility does not include technical data, but is limited to format and responsibilities of this nature that can be performed more economically in one location. A similar transfer relocates a publication section in the Sales Department.

C. Service Tool Engineering. Relocate this activity under Service Engineering. No reason for the present division of responsibilities is evident.

D. Technical Investigations. Transfer the inspection functions to the Quality Control Department. Special investigations are considered of major importance and are the subject of a separate recommendation -- that of creating a new position "Assistant to the Service Manager" (to be discussed).

E. Assistant to the Service Manager. This new position has been created to recognize the importance of special investigations, to increase the status of the incumbent in relation to other departments in the Division, and to permit more complete freedom of assignment to special projects.

F. General Supervisor Service Sales. Disestablish this position. This position would control only two activities in the proposed organization and in effect just increases the distance to upper management -- cost not even considered.

G. General Supervisor Technical Service. Disestablish this position. The reasons for this recommendation are identical to those stated for General Supervisor Service Sales.

H. Assistant Service Manager. Disestablish this position. The Service Manager in the proposed organization supervises only four activities -- actually an ideal span of control -- with an "assistant to" for assignment to special projects as appropriate; a need for an assistant is not considered to exist.

At present the Service Department is considered too specialized and has too many executive levels fitted into the organization structure. This condition is remedied in the proposed organization which is illustrated in Chart 1-16.

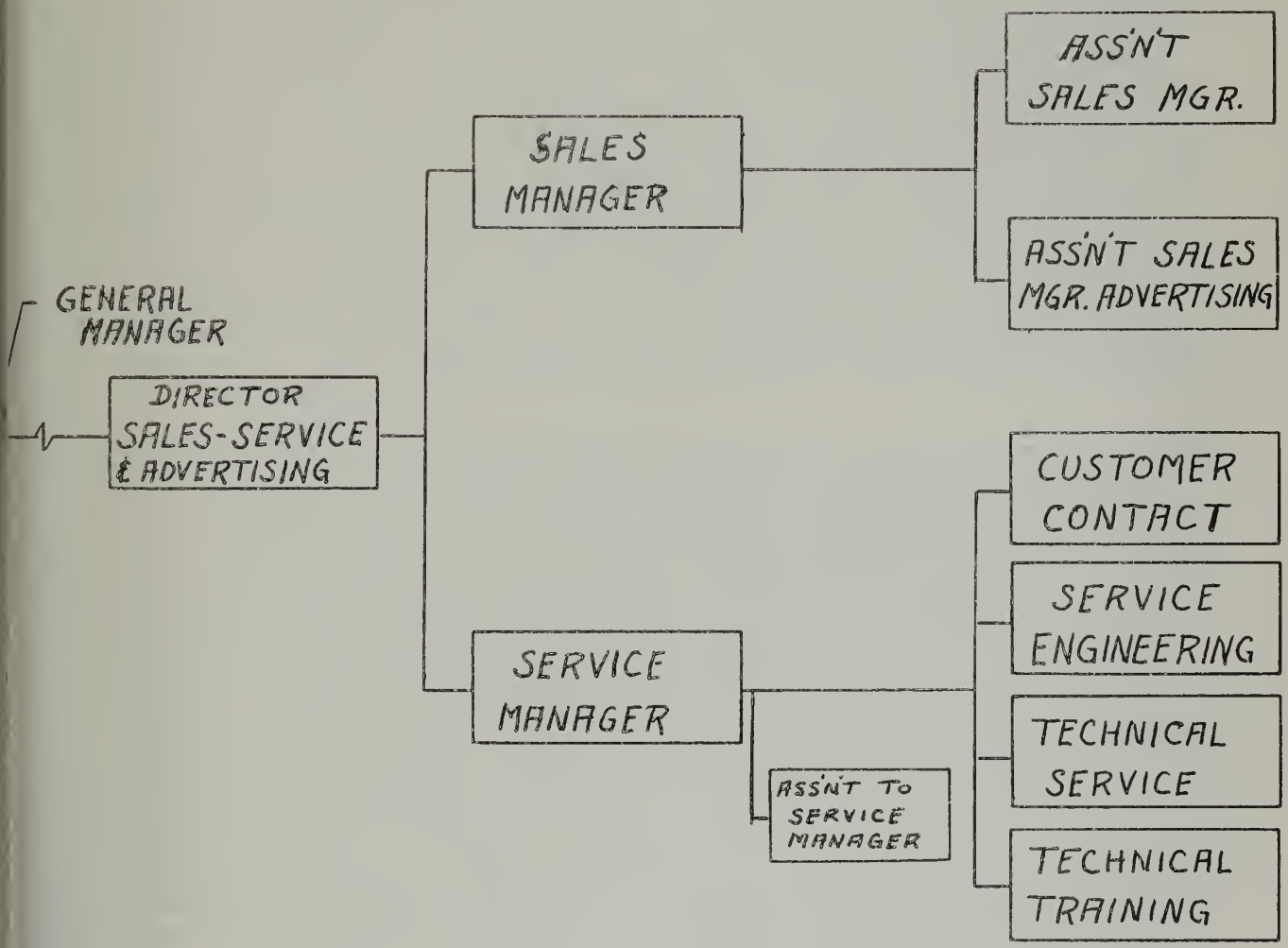
II. Advertising Department. At present this department consists of one man, the Advertising Manager. The major part of the Advertising Manager's time is spent in the distinct area of Sales and technically under the cognizance of the Sales Manager. It is recommended, therefore, that the Advertising Manager be relocated in the Sales Department with the title of Assistant Sales Manager, Advertising.

The newly created position, Assistant Sales Manager, Advertising, will retain the responsibilities previously assigned to the Advertising Manager. In addition to these duties, it is recommended that a function presently duplicated to a certain degree in both the Sales and Service Departments be combined and assigned to the Assistant Sales Manager, Advertising. These functions are the Liaison Information and Publication Section presently located in the Sales Department and Service Publication Section presently located in the Service Department.

III. Sales Department. The changes advocated in the Sales Department are not as extensive as those in Service and Advertising. The basic changes are caused by absorption of the activities being assigned to the Sales Department by changes made in other departments. Summarizing, these changes

include the creation of the position "Assistant Sales Manager, Advertising" and the assumption of the responsibility for "Trade Sales". (The relocation of the Liaison Information and Publication Section to the Assistant Sales Manager, Advertising is included in the creation of that position.)

One additional recommendation completes the organizational recommendations for this department. This recommendation pertains to the existing position of "Assistant to the Sales Manager". This position as presently described is very important; however, it cannot be classified as a true "assistant to". This position should be called an Assistant Sales Manager for it fills every requirement, including that of possessing complete line authority. The need for two Assistant Sales Managers is not considered appropriate in an ideal organization under the present conditions. The solution appears to be combining the positions, delegating appropriate authority and responsibility to qualified subordinates as necessary.




# SALES, SERVICE & ADVERTISING DEPARTMENT

(PROPOSED)

CHART 1-16

1.392 Committees. As part of the study on the organization of the Division, an attempt has been made to determine the extent of the use of committees to accomplish various phases of work. Considerable difficulty was encountered in obtaining this information. This is attributed to the lack of a definition of a committee, failure to outline the functions and responsibilities of committees, and to the fact that there is no centralized control or co-ordination of the various committees throughout the Division. The information concerning committees that was obtained is given in Section 1.2. This includes the name of the committee, purpose, chairman, members, and how often it meets. It is recognized that this information may not be complete nor entirely accurate. For purposes of this study, a group which meets together has been considered a committee if it has a definite purpose, or function, assigned members, and an established time of meeting (ranging from daily to as required or at the call of the chairman). Many personnel in the Division do not consider the numerous "meetings" they may attend to be bona fide committees. However, one or two members of the same "meeting" would call it a committee and eventually the desired information was acquired.

It is not possible to say that the Division has too many (or too few) committees from the information acquired. It is desirable, however, to recommend that the company make this determination. A careful study should be made to determine what functions now require committee action, but should require only a single individual to make a decision. The study should also determine any areas in the present organization, which, because of the division of some of the functions, require a committee to co-ordinate the work. An example of this may be the Building and Maintenance Co-ordination Committee. In this example, by placing these functions under one individual, the need for a co-ordinating committee may disappear. Committees do have an important place in the organization of a company. However, if not properly controlled, many personnel will be spending most of their time attending committee meetings, which can result in inefficient utilization of personnel. It is recommended that the company review this situation, using the information presented in Section 1.2 as a starting point, and determine its actual needs along these lines. In so doing, a central control should be established to ensure continued efforts in this area, and should function to maintain all information designating proper committees and defining the duties and responsibilities of each.

## 1.4 Summary of Recommendations.

1.41 General Observations. The comments made under this classification are not substantiated in detail in the preceding sections due to the overall nature of the recommendations.

1. Establish a standard organization numbering system applicable to and compatible with the requirements of all organizational entities. Presently there are three known numbering systems, e.g., accounting system, position description system, and departmental numbering system.

2. Establish standard organization level titles; e.g., group, division, department, section, subsection, unit.

3. Prepare and maintain an up-to-date organization manual.

1.42 Specific Recommendations.

1. Reduce the span of control of the General Manager (ref. 1.31).
2. Transfer the Traffic Department to the Manufacturing Department (ref. 1.32).
3. Transfer the Plant Property Department to the Plant Engineering Section (ref. 1.33).
4. Create a position with new responsibilities titled Assistant Factory Manager (ref. 1.34-I).
5. Assign additional responsibilities to the activity Plant Engineering (ref. 1.34-III).
6. Reorganize certain functions of the Production Manager (ref. 1.34-IV).
7. Establish a new activity titled Production Scheduling (ref. 1.34-VI).
8. Establish a new Department titled "Planning" (ref. 1.35).
9. Establish a new Section titled Manufacturing Engineering (ref. 1.34-V).
10. Transfer the Trade Sales Section of the Service Department to the Sales Department (ref. 1.391-I).
11. Transfer the Service Publication Section of the Service Department to the Assistant Sales Manager, Advertising (ref. 1.391-I).
12. Relocate the section "Service Tool Engineering" in the Service Department (ref. 1.391-I).

13. Combine the following sections of the Service Department: Technical Investigation Section and Technical Field Service Section (ref. 1.391-I).
14. Establish a new position "Assistant to the Service Manager (ref. 1.391-I).
15. Disestablish the following positions: General Supervisor Service Sales, General Supervisor Technical Service, and Assistant Service Manager (ref. 1.391-I).
16. Relocate the position of Advertising Manager to the Sales Department (ref. 1.391-II).
17. Combine the following sections under the Assistant Sales Manager, Advertising: Service Publications Section of the Service Department and the Liaison Information and Publication Section of the Sales Department (ref. 1.391-II).
18. Disestablish the position "Assistant to the Sales Manager (ref 1.391-III).
19. Establish a new position "Assistant Director of Engineering for Design", thereby disestablishing the present position "Assistant Director of Engineering" (ref. 1.36).
20. Organizationally relocate the General Administration Section of the Engineering Department (ref. 1.36).
21. Introduce a supervisory function for quality control and disestablish the function of Assistant Quality Control Manager (ref. 1.37).
22. Transfer the functions performed by two staff assistants, billing and cost of sales to General Accounting (ref. 1.38).
23. Relocate the sections Standards and Drafting to a position of staff to the Assistant Director of Engineering for Design (ref. 1.36).
24. Establish a new position "Office Manager" to serve all departments and place it, organizationally, in the Accounting Department (ref. 1.38).
25. Transfer the functions of Security and Plant Guards to the Industrial Relations Department (ref. 1.39).
26. Transfer the Safety Engineer, Medical, Group Insurance and Group Compensation functions from the Plant Protection Department to the Industrial Relations Department (ref. 1.39).
27. Publish an official Division document defining and setting forth procedures for the establishment of recognized committees. Included as enclosures to such a document should be a list of currently authorized committees indicating the chairman, members, objectives, and convening frequency (ref. 1.392).

# CHAPTER II - INDUSTRIAL RELATIONS

2.1 General. The Industrial Relations Department employs around 20 people and is divided, under a Director and Assistant Director, into four major functional divisions: Personnel Administration, Wage and Salary Administration, Employment Supervision and Training Supervision. The formal duties and responsibilities of the Department are engendered by the organization chart, corporate regulations and individual position job descriptions. The Department appears to be well indoctrinated in its roll of staff service.

## 2.11 Major Personnel Categories.

2.111 Hourly Rated Employees. Hourly rated employees are those factory employees comprising the bargaining unit.

2.112 Non-Exempt Salary Employees. Non-exempt salary employees are the office workers, generally clerical, who do not meet requirements for exemption from overtime payment under the Fair Labor Standards Act and the Walsh-Healy Act.

2.113 Exempt Salary Employees. Exempt salary employees are salaried employees meeting the requirements for exemption from overtime payment under the above-named Acts. The three sub-categories defined by federal statute may be summarized as follows:

1. Executive.

   a. Pay of $55.00 or more per week.
   b. Directs a regular working force.
   c. Limited to spending not more than 20% of working time in performance of "non-exempt" work.

2. Administrative.

   a. Pay of $75.00 or more per week.
   b. Formulates or enforces major policy; requires exercise of independent judgment and discretion.
   c. Limited to spending not more than 20% of working time in performance of "non-exempt" work.

3. Professional.

a. Pay of $75.00 or more per week.
b. Practices a creative art or skill customarily acquired through a specialized and prolonged training program.
c. Limited to spending not more than 20% of working time in performance of "non-exempt" work.

2.12 Union Contract. A bargaining agreement exists between Scintilla Division and Sydney Lodge No. 1529 Affiliate Of The International Association Of Machinists. The Agreement was entered into as of 1 October 1956 and will remain in force for three years. It is a typical and comprehensive bargaining agreement and will not be detailed in this report.

2.13 Fringe Benefits. Among fringe benefits afforded employees are the following:

2.131 Group insurance including life insurance, weekly disability benefits, hospital, surgical, medical and major medical payments. With the exception of life insurance and weekly disability benefits, the foregoing apply to employee dependents. Both the employee and the Division contribute.

2.132 Pensions. Pensions consist of a "basic" plan paying $2.25 per month for each year of service (up to 68 years of age and since 1929) and a "senior" plan, for salaried employees only, based on both service and earnings. The Division is the sole contributor.

2.133 Vacations. Paid vacations are given on the basis of one day per full month worked prior to March 1 for employees with less than one year's service as of June 30, for salaried employees only; two weeks for employees with less than ten years' service; two and one-half weeks for employees with less than fifteen years' service and three weeks for employees with over fifteen years' service.

2.134 Holidays. Seven paid holidays per year are granted all employees.

2.135 Sick Leave. Sick leave ranges from five days for employees with service of three months to one year to twenty-two days for employees with more than three years' service.

2.136 Educational Assistance. Educational assistance for courses taken outside regular working hours is offered employees who have been with the Division for more than six months. The assistance consists of payment of one-half of tuition, books and laboratory fees in accredited courses after satisfactory completion of the course.

2.14 Policy And Procedure Publications.

2.141 Industrial Relations Handbook for Supervision. The Industrial Relations Handbook for Supervision is maintained to provide supervision in all departments with information concerning the organization and operational practices of the Industrial Relations Department. This manual outlines procedures in the areas of employment, personnel, training and wage and salary administration for hourly wage employee supervisors.

2.142 Industrial Relations Department Policies. The Industrial Relations Department Policies Manual is made up of letters, memoranda, inter-office correspondence and notices over signatures of various positions and levels of position. Its purpose is to delineate policies governing the operation of the Industrial Relations Department. In addition to this manual there is maintained a loose-leaf binder containing miscellaneous procedures and policies (both for the Division and for the Industrial Relations Department), sample forms and form letters.

2.143 Index of Employment Forms. The Index of Employment Forms is a binder containing employment forms, with instructions for their use, and brochures used for orientation purposes.

2.144 Discussion. The purpose of policy and procedure publications is to set forth in orderly fashion rules for and aids to efficient operation. To be of maximum effect they

must be lucid, well organized and readily available to all who need them. This requires, among other things, that they follow a recognized and ordered format and exhibit evidence of having been promulgated by the proper official. A logical primary division would be into two components: Division policy promulgated by the General Manager and Department policy by the Director of Industrial Relations. Orderly organization along such lines would:

1. Increase usefulness of existing policies.
2. Highlight areas not sufficiently covered.
3. Point up duplications.
4. Clarify requirements for coverage on the Department level.

2.2 Personnel Administration.

2.21 General. The main function of this section is dealing with day-to-day problems and needs of all employees. This includes such things as: jury duty excuses, approval for plant-wide collections, military color guard excuses, pay for time lost in callouts for first aid squad emergency, Civil Air Patrol, Civil Air Defense, trade account delinquency charges, housing, transportation, pay for holidays and sick leave. Other functions of the section are exit interviews with all departing employees, maintenance of lists of union officials and stewards, follow-up on "delinquent gage" procedures (employees who fail to return inspection gages to the tool room on time for monthly check are subject to one-day disciplinary suspension), bulletin board notices, grievance records, and pension plan for hourly-rated employees (administration in accordance with the union contract). The Personnel Administration Section has the following responsibilities in the field of "welfare and recreation": arrangements for employee banquets, acting as company advisor to the management club and the non-exempt salary club, contributions to employee recreation activities such as sports, choir, hobbies, retirement counselling and retirement library, and sale of products of other Bendix Divisions at reduced price, when available.

2.3 Wage and Salary Administration.

2.31 Job Descriptions.

2.311 Initiation. There is a job description for every job in all employee categories. Job descriptions for hourly-rated jobs are written by the Industrial Relations Department in conjunction with appropriate supervisors and are then subject to negotiation with the union in the matters of content, assigned grade and wage. Job descriptions for non-exempt and exempt categories are written by the Industrial Relations Department in conjunction with the using departments. The grade to be assigned is then determined by direct comparison, job-to-job, of overall job content, with any "in existence" job which appears to be somewhat comparable.

2.312 Use. The major uses to which job descriptions are put are as follows:

1. Hourly-rated jobs; used to police work content.
2. Non-exempt jobs; used to determine what is needed in a new-hire.

This serves as a check on validity of employment requisitions.

2.313 Review. Corporate policy dictates that all job descriptions be reviewed annually. In practice about 25% are given close scrutiny annually with the other 75% being reviewed in a somewhat less rigorous fashion.

2.32 Job Evaluation.

2.321 General. The employees in the non-exempt salary and exempt salary categories are divided into eighteen grades: non-exempt, grade I - IX; exempt, grades VII - XVI. These grades were originally established by evaluating all jobs in the Division. There is a chart composed of a ten factor-five degree scale in existence but this is ordinarily not used.

The method currently in use to arrive at a wage for a new job consists of a direct over-all job-to-job comparison, first deciding upon a wageto pay for the job and then fitting it into the grade that fits the wage. This wage is decided upon by the Wage and Salary Administrator in conjunction with the prospective supervisors on such bases as : usual wage in the "area" and "industry" for the type of work involved; wage level of jobs which will be supervised; wage level of jobs which will supervise the job; supply and demand. An attempt

is made (rule of thumb) to set pay rates so that a supervisor may earn at least 25% more than the highest paid employee under his supervision.

Occasionally an artificial upper limit in a grade is fixed for a particular individual (lower than "tops" for the grade). This allows a promotion where it could not be justified otherwise. For example, an employee may be competent to do work of grade VI worth but only on certain products. If a requirement for grade VI is competency of the assumed amount in all products, the employee could be promoted into grade VI with the restriction that he could not reach "tops" in grade VI without further development.

2.322 Hourly-rated employees. These employees make up the collective bargaining unit and their grades, pay rates and automatic in-grade increases are covered by provisions in the union contract. There are two schedules in the contract, one for productive occupational classifications and one for non-productive classifications, each having twelve grades with a minimum and four in-grade increases at six-month intervals. There is a further provision that wage rates for women shall be set in accordance with the principle of equal pay for equal work.

In the case of a new-hire, starting grade and wage is determined informally with some set standards. The Wage and Salary Administrator in conjunction with the prospective supervisors makes this determination considering the new employee's education and experience record, family situation, etc.

The union contract sets forth rules for minimums in cases of in-plant transfers.

2.323 Area Wage Survey. This function is carried on informally by the Wage and Salary Administrator. Annually the Binghampton, New York Chamber of Commerce performs a survey. This report is made available to the Division.

2.33 Pay Rate Changes.

2.331 General. The following is a list of average numbers

of monthly rate changes at present employment level:

1. Hourly rated employees - 100.
2. Exempt salary employees - 40.
   a. This includes rate increases, promotions, terminations, new-hires, etc.
3. Non-exempt employees - 100.
   a. This includes rate increases, promotions, terminations, new-hires, etc.
   b. Approximately forty percent of the employees in this category have reached "tops" in grade.

2.332 Initiation. The pay rate changes for hourly-rated employees are a part of the union contract. Those for non-exempt salary and exempt salary employees are initiated by their supervisors in accordance with Division policy discussed in Section 2.34 of this report, or by the Wage and Salary Administrator. The proportion in the foregoing is about half and half.

2.333 Limitations. This is covered in the union contract for hourly-rated employees. In the other two categories the following apply, not inflexibly, but as firm guide lines:

1. Exempt salary employees.
   a. Maintain an upper limit of six percent increase per year for each department.
   b. Maximum of fifteen percent for any individual raise.
2. Non-exempt salary employees.
   a. Maintain an upper limit of five percent increase per six months for each department.
   b. Maximum of ten percent for any individual raise.
   c. Increase no more than ten percent of the personnel in any department in any month.
   d. Re-appraise starting wages when appropriate; usually after first six months' employment.

It is the policy of the Division not to allow a transfer, or similar personnel transaction, to result in a decrease in pay; and further, to assure, within limits, that a supervisor earns at least twenty-five percent more than any worker supervised by him.

2.334 Approval. Final approval for all rate changes is by the General Manager.

2.34 Merit Rating.

2.341 Hourly-rated employees. Automatic semi-annual pay raises (until "tops" in grade is reached) are provided for in the union agreement. As a consequence there is no need here for merit rating as a means of determining pay increases. The Division feels that any incompetence which might be revealed by merit rating would, without merit rating, appear as poor level of production and/or high scrap and reject percentage.

2.342 Non-exempt salary employees. Division policy calls for the semi-annual review of each employee by his supervisor. The supervisor, apparently by any standard he chooses to employ, recommends for pay increase those he thinks deserving (within limits noted in Section 2.33 of this report). Except as recommendations for increase are submitted, no official record of this semi-annual review is made. Recommendations for rate change are submitted, by memo, telephone or in-person, to the Wage and Salary Administrator who:

1. If an employee fails, over a ten-month period, to be recommended for increase, checks to make certain this did not result from an oversight.
2. If an employee fails, over a fourteen-month period, notifies the employee's department head and the General Manager. Occasion for this rarely arises.

2.343 Exempt Salary Employees. Division policy calls for the annual review of each employee by his supervisor. If a supervisor feels than an employee is deserving, he will recommend the employee for an increase. The supervisor may or may not suggest an amount for the increase, which amount will be finally determined by the supervisor and the Wage and Salary Administrator (again within limits noted in Section 2.33 of this report).

2.344 Discussion. A formal merit rating program provides

a substantial and consistent foundation upon which all raters may base their judgments. The program can accomplish its objectives through two main methods:

1. Division of factors. One insidious source of rating error which is effectively combated by a well administered merit rating program is the so-called "halo effect", the carry-over of judgment of one factor of job performance or of one personal quality to others where it does not apply. It must be recognized that in rating by over-all appraisal a clash of personalities or undue intimacy between a supervisor and his subordinates may result in inaccurate opinions. Thus a rating which is an aggregate of factoral ratings is much more likely to be a true representation of the ratee.

2. Provision of a rating scale. The propensity to rate factors in the abstract, neglecting their relevance to the particular job being performed is a common fault. Instead of asking a rater to rate "reliability" or any other trait and then giving him carte blanche to interpret these factors, the rating scale defines each factor so that maximum agreement, between raters, as to just what demonstrates a factor will obtain. The rating scale, must, of course, be used with care. At its worst, the rating scale may become a substitute for good judgment, and by its superficial appearance of scientific objectivity lead to an erroneous assumption that an accurate measurement has been made. At its best, a well-constructed rating scale aids in focusing attention on relevant traits, one by one, in judging these traits, and in recording judgments with greater accuracy and consistency than otherwise would result from a general impression.

2.35 Supplemental Pay Policies.

2.351 Extended Work Week Premium. This applies to exempt salary personnel only and is used to maintain differential between supervision and employees. It is dependent upon regularly scheduled departmental work or upon individually scheduled Saturday work.

2.352 Cost of Living. All employees in the bargaining unit are covered by the provisions for a cost of living allowance as set forth in the union contract.

2.353 Separation Pay. Separation pay, which is used for layoff or separation under mutual agreeable conditions, consists of pay for two weeks to six months depending on length of service. Quits and discharges are not included and any payment requires the approval of the General Manager.

2.354 Unemployment Insurance. This is paid for by the Division on the basis of an experience rating which rises or falls according to the record of the previous year. (See Section 2.49 of this report.)

2.4 Employment Supervision.

2.41 Ceilings. There is no established employment ceiling. Any supervisor is empowered to initiate employment requisitions.

2.411 Discussion. The Division employs thousands of people in many occupations and must protect itself from inflation of the labor force, particularly on indirect occupations. Just as a series of checks are provided to insure that pay envelopes are delivered to the correct people in the correct amount, so it is valuable to set up safeguards to insure that no more than the requisite number of people is employed on particular jobs. This is accomplished by establishing ceilings, or maximum quotas for all occupations.

2.42 Recruiting. In general, the recruiting of hourly-rated employees poses no problem; a sufficient supply is normally available through application at the plant gate. Recruitment of non-exempt salary employees is by newspaper and through the New York State Employment Service. The senior supervisory personnel of the Industrial Relations Department, with occasional assistance from other Departments, carry out engineer recruiting at colleges.

2.43 Interviewing. Interview of new-hire applicants is handled, with occasional help, by one "Interviewer". The applicants are met in a waiting room by the Interviewer (on Mondays by one of the Industrial Relations Department clerks) and are asked to fill out an application, a personnel questionnaire and a skills questionnaire (some applicants

will have done this previously). When appropriate, additional tests are administered for special shop or office skills; manual dexterity tests for coil winders, typing and shorthand tests, etc. The applicant is then accorded an interview, usually quite brief, and falls into one of three categories:

1. Unacceptable. Application is destroyed after the Interviewer's comments are recorded on a file card for retention.

2. Acceptable but not hired. Application, annotated by the Interviewer, is retained. A file card is made to be retained in file by jobs for which qualified.

3. Acceptable for immediate placement. In this case the interview becomes somewhat more extended in order for the applicant to learn a little about the union, job, wages, pension, insurance, etc. The Interviewer attempts, however, to leave most of this to the clerks in the employment section in order to be able to process other applicants. In an average five-day week the Interviewer will interview over 100 people; there are usually between 10 and 15 interviews per placement. At the discretion of the Interviewer, the applicant may be interviewed by the department concerned either before or after the initial interview. After a physical examination, the applicant returns to the Interviewer who checks the results and sends the applicant to the employment section clerks who complete the required papers and escort the new employee to his department supervisor. Form letters requesting references are sent out to firms listed on the employment application for each new employee. Employment is probationary for 45 days for shop workers and for one year for office workers.

2.431 Discussion. Normally there is no receptionist between the Interviewer and job applicants. A receptionist in this position could be used for getting applicants started on applications and for gaining a general impression to pass on to the Interviewer. It might be worthwhile to consider a system wherein the receptionist would type up employment applications rather than having applicants make them out by hand. This would put the application in a good legible form for permanent record. It is not necessary that this involve added expense since this information is, under the system currently in use, retyped onto a "Personnel Card" which could be eliminated. There is a possible complication if the preparation of the

application is considered a literacy test. The work load for the Interviewer is such that he could well use the time gained for him in making interviews somewhat more comprehensive than is currently possible and/or to make the follow-up interviews.

There is no follow-up interviewing, either with the new employee or his supervisor. Benefits to be derived from a program of follow-up interviews are:

1. Validation of interviewing techniques, content of interviews, testing and training.

2. Job satisfaction for Interviewer through completing the job and seeing the results.

3. Employee morale. This is a good opportunity for the "company" to demonstrate to the employee their interest in his welfare while at the same time gathering valuable information.

4. Discovery of unfavorable working conditions.

2.44 Hiring. Approval for the hire of direct labor personnel (production departments) is by the Factory Superintendent while that for indirect labor is by the General Manager.

At this point, a decision is made by the Wage and Salary Administrator as to whether a position falls in the exempt or non-exempt category. Penalties consisting of back overtime pay at two or three times the accrued amount may be levied for improperly placing employees in exempt category.

2.45 Personnel Records. Under the supervision of the Employment Supervisor, the following personnel records are maintained:

1. Personnel folders. These folders are not open to the employees on the basis that they contain confidential material, e.g., employment recommendations. Should an employee wish any specific information from his folder, other than confidential material, this will be supplied him. Personnel folders contain original application for work, test results, draft classification card, patent agreement, insurance enrollment card or waiver, personnel card, reference letters, residence address record, and employee data form.
2. Seniority lists.

3. Attendance records.
4. Unemployment insurance records.
5. File of former employees with satisfactory employment records who are receiving unemployment compensation.
6. Application file. This is a record of employees who are requesting transfer from one job within the Division to another.
7. Qualification cards. This is a program being instituted currently whereby an IBM card is being prepared for each employee showing his education, experience, etc., in order to facilitate in-plant recruiting and placement.
8. Payroll record. This is actually a wage record showing pay rate held, past and present, and job classification; not used for computing payroll.
9. Selective service deferment records.

2.451 Discussion. The "Employee Data" form lists the job, class, pay rate, shift, etc. of the employee. All the information on this form is also available on the employee's original application with the exception of the probationary period notice. The employee signs this form to evidence knowledge of the probation period (which would be effective regardless of signature or lack of it). The duplicate of the form is used as a gate pass on the first day of work, as the new employee's badge cannot be prepared the same day he is hired.

Assurance could be had that new employees have been apprised of the stipulations of employment without requiring a signed statement. The security section could issue the new employee a registered temporary badge from a small supply to be held for this purpose (employee signs for custody of badge in log kept by the security section and the security guard signs the badge in when the employee returns it after having been issued his permanent badge.) This could possibly be combined with the routine for forgotten badges. Thus the "Employee Data" form could be eliminated.

An "Address Record", in triplicate, is made for all new-hires and for every employee change of address. Distribution of copies is to the personnel folder, first aid room and mail room.

Assuming real need for address information in more than one office, it should be possible to streamline this procedure. The mail room could use addressograph to prepare a master address list for distribution to the Industrial Relations Department, the first aid room, the mail room and any other interested sections. Change of address cards could be

submitted directly to the mail room for use in making periodic supplements to or new issues of the master address list. If considered necessary for information of individual changes to be available in the interim between issues by the mail room, the change of address card could be made out in duplicate at the information counter in the Industrial Relations Department, one copy sent to the mail room and the other retained at the point in need of the information in the aforementioned interim period.

Redesign of the employment application form could permit the following:

1. Eliminate the "Draft Classification Card" by including this information on the application form. A separate file is also kept on those employees who are eligible for the draft.

2. Eliminate the "Personnel Card" by attaching the employee's photograph to his application form. The primary purpose of the "Personnel Card" is duplication. Employees' application forms are sometimes borrowed from the Industrial Relations Department files by other departments and the "Personnel Card" supplies information in case the employment application is out of the files when some information is sought or in case of loss of the application. Loss should be infrequent enough to warrant the expense of recreation by the employee in such cases and it is seldom likely that there is real need to keep an application out of a personnel folder long enough to cause significant inconvenience.

An "Insurance Waiver" is prepared in all cases when a new employee does not subscribe to the company insurance plan, and he is required to sign the waiver which is filed in his personnel folder. The purpose of this is to be certain that each employee is informed of his insurance opportunities and to prevent the possibility of charges of lack of information in case of sickness or accident to a non-insured. Charges seem unlikely and the possibility of serious consequences remote. Surety against failure to afford a new employee the opportunity for insurance could be accomplished by preparing an employment folder or check-off list to be covered with each new employee at some point in the hiring process. The insurance waiver could then be eliminated.

A patent agreement is executed for every new employee although it is required only of certain categories. If it is considered necessary for all employees, this could be included in the revised application form noted above. Otherwise it could be executed only for those requiring it. This would necessitate a sure check in each case of in-plant transfer which could be supplied by listing this as an item in an in-plant transfer folder or check-off list similar to the one mentioned above for new-hires in connection with the "Insurance Waiver".

The "Attendance Card" is so designed as to require typing of a separate additional strip in order to utilize cardex filing. A re-designed card should make it possible to eliminate this.

2.46 In-Plant Transfers. Any employee may apply for transfer to a different position of his choice. If qualified, he is placed on a list of employees who have applied for the position in question. The decision as to qualification is made by the Employment Supervisor and appropriate supervisors. If and when the job opens up, the employee with longest seniority among those on the application list is called for interview. The Senior Interviewer explains the job, shift, etc., and reviews the qualifications of the applicant. If the Senior Interviewer deems it appropriate, an interview with the line supervisor involved is arranged. Normally no performance tests are given unless it appears to the Senior Interviewer that the employee is not qualified and he wishes to verify this. If the job being applied for is in the department where the employee is currently employed, the qualification of the employee for the job is determined by calling the department supervisor. An applicant who is apparently not fully qualified is discouraged from taking the job, both because he would be unlikely to be an asset in the job and because of the policy that if the employee fails to produce on the new job, he does not revert to his former job, but is laid off. The employee is required to sign a statement as to whether he accepts the new job; if he refuses the job, it is offered to the next senior applicant on file. This system is apparently largely responsible for most vacancies above the bottom level in the plant being filled from within the plant.

2.461 Discussion. As in the case of new-hires, there is no

follow-up interviewing in this section. Although benefits accruing here would not likely be so manifold nor substantial as in the new-hires area, it may be sufficient to warrant consideration.

2.47 Grievances. The average number of grievances annually since 1951 is 132. As is indicated by the large average number of withdrawals, 76, the number of grievances is considerably swelled by the contract stipulation that grievances over discipline and discharge be filed within three days. This stipulation results in almost automatic grievance filing over any discharge even though the discharge may appear to be justified. The following is a list of grievance categories in order of frequency of occurrence:

1. Disciplinary layoff and discharge.
2. Distribution of overtime.
3. Qualifications for promotion or "bump".

A tabulation of grievances since 1951 appears below in Chart 2-1.

| ear | Total Filed | Won by Co. including withd'wls. | Arbitrator Decisions | | | With-d'wls. | Settlements Prior to Arbitration | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Co. | Union | Tie | | Co. | Union | Tie | Settled on Floo |
| 951 | 140 | 86 | 20 | 15 | 1 | 64 | 38 | 0 | 0 | 0 |
| 952 | 166 | 103 | 24 | 3 | 3 | 74 | 5 | 42 | 15 | 0 |
| 953 | 165 | 128 | 4 | 0 | 1 | 123 | 1 | 22 | 13 | 1 |
| 954 | 130 | 84 | 4 | 6 | 1 | 80 | 0 | 19 | 16 | 4 |
| 955 | 104 | 72 | 7 | 4 | 2 | 60 | 5 | 16 | 10 | 0 |
| 956 | 89 | 55 | 1 | 1 | 0 | 53 | 1 | 14 | 4 | 1 |

CHART 2-1*

*Inconsistencies in figures for 1956 are due to grievances not yet settled when this tabulation was compiled.

2.48 Discharge. A foreman or higher level supervisor may undertake to discharge an employee without notice for cause. The union agreement specifies that the Chief Steward must be notified the same day in time for him to be able to talk with the employee before the employee leaves the plant.

2.49 Unemployment Insurance. The New York State unemployment compensation insurance program operates on the "merit system". This means that a company is taxed in accordance with the number of its former satisfactory employees who have been laid off and are consequently on the unemployment rolls. The aim of the "merit system" is to encourage low turnover. A file is kept of former employees, with satisfactory service, who are receiving unemployment compensation. The purpose of the file is to put these people back to work when openings appear, thereby minimizing the Division's unemployment insurance tax liabilities while re-employing trained and experienced people.

2.5 Training Supervision. As head of the Training Section, the Training Supervisor working under the Assistant Director of Industrial Relations is responsible for planning, organizing, administering, and/or conducting all types of training programs and educational activities for all employees. In addition to these training and educational activities, he is responsible for Personnel Testing, the Suggestion System, the plant publication, "The Scintillator" and Public and Employee Relations.

To assist the Training Supervisor in his duties, there is a Training Section Stenographer, an Editor of "The Scintillator" and a Senior Clerk.

The duties and responsibilities of the Training Section Stenographer are:

1. Receptionist.
   A. Greet and guide visitors in the Training Section.
   B. Handle telephone inquiries.

2. Dictation.
   A. Correspondence and memoranda.
   B. Training materials.
      a. Management Conferences - announcement and follow-up.
      b. Schedules for Supervisory Programs.
         1. Job Instruction Program.
         2. Work Simplification

c. Course outlines, unit instruction sheets.

C. Suggestion System letters.

3. Typing.

A. Transcribe correspondence and memoranda.
B. Transcribe instructional materials.
C. Prepare multilith masters, originals for sensitized masters and ditto masters for:
   a. Personnel Tests.
   b. Special program announcement memos.
   c. Management Training Program applications.
   d. Tests for instructional courses.
   e. Brochures.
   f. Audio-Visual Training Aids Catalog.
   g. Booklets.
   h. Management Conference material.
D. Requisitions.
E. Copies of Suggestions for Investigators.
F. Acknowledgment letters, transcribe acceptance and rejection letters to Suggesters.
G. Reports.

4. Filing.

A. Correspondence.
B. Training material.
C. Suggestions.

5. Deliver material to other departments and obtain material and signatures therefrom.

6. Orientation.

A. Prepare envelopes of materials for new employees.
B. Check absentees.
C. Explain procedure for ringing over-time passes to new employees.

7. Records.

A. Suggestion Control Book.
B. Attendance for Orientation classes.
C. Attendance for Management Conferences.
D. Card file on all Suggestions.
E. Apprenticeship program.

8. Mail.

   A. Date stamp and record Suggestions.
   B. Date stamp and record Investigation Reports for Suggestions.
   C. Handle U.S. and intra-departmental mail as appropriate.

9. Collate and assemble duplicated material.

10. Reports.

   A. Suggestion System.
   B. Apprenticeship Program.
   C. Training Program.

11. Machines.

   A. Operate ditto duplicator for Training Section material.

The duties of the Editor of "The Scintillator" will be discussed under the section on the publication.

The duties and responsibilities of the Senior Clerk are:

1. Detailed Suggestion System co-ordination and investigation.

2. Administration of Personnel Tests -- Psychometrist.

3. Audio-Visual Aid supervision.
   A. Equipment.
   B. Training Center.

4. Assist in training activities in general.

2.51 Training. The major areas into which the activities of this section may be divided are as follows:

1. On-the-Job Training.

This is the most important and extensive training activity conducted at the Division. Personnel who are employed as trainees are thoroughly instructed in how to perform

their work and in the use of all necessary materials, supplies, tools and equipment. The instructing is done by supervisors, foremen, or other designated personnel, such as group leaders, who have been trained in the four-step method (prepare, present, try-out, follow-up) of effective job instruction. The instruction is supplemented by the use of such training devices as models, charts, cut-aways, and other visual aids.

2. Organized Classroom Instruction.

As the need arises, courses are organized and conducted for selected personnel. These classes are held in a very well equipped Training Center which will seat about 50 people. All instructors have either a background of professional education or are trained in modern teaching techniques. A record of all classes completed by each employee is maintained in the Training Section office. Examples of these courses are : Blueprint Reading, Applied Mathematics, Motion Economy, Statistical Quality Control, Technical Training Program for Engineering Personnel, Work Simplification, Orientation for New Employees, Mica Training, Applied Electronics, Inspector Training, and special programs, such as conferences and seminars concerning specific technical subjects.

3. Management Development and Training.

The core of the training activities for management personnel is a continuing series of conferences. These conferences are designed to inform management personnel concerning those matters which will enable them to function most effectively as members of management. Conferences are presented by the various departments and sections of departments, as well as special programs conducted by qualified people not connected with the Division. In addition, specialized training programs are conducted for management personnel from time to time in management tools and techniques, such as Effective Communications, Human Relations, and the like. Literature for training and development purposes is also distributed to all management personnel. Increased emphasis on this program should bear excellent results as it has in the past series of cost-conscious conferences.

4. Apprenticeship Training Program.

Apprenticeship training programs for toolmakers, machinists, and tool designers are in operation. These programs consist of organized on-the-job training and related

classroom instruction. All programs are registered with and approved by the New York State Apprenticeship Council.

5. Training Literature and Materials.

Instructional materials to meet specific needs are prepared, published and distributed, covering such subjects as: Welding Handbook, Ceramics Handbook, Handbook for Soft Soldering, Mica Manual, Communications Handbook, Inventory Manual, Statistical Quality Control Manual, etc.

6. Audio-Visual Equipment.

The Training Center is equipped with all types of audio-visual devices such as: projectors for motion pictures, slides, slide films, opaque material and transparencies. In addition, the equipment includes a tape recorder, microphones and amplification equipment. An extensive film library is available and films are continually being secured from a variety of sources for showing to selected groups of personnel.

7. Establish, Maintain and Co-ordinate Training with Outside Agencies.

A close working relationship is maintained with both day and adult educational programs at public schools, technical institutes and colleges as well as home study courses. Through a progressive educational assistance policy, Scintilla pays one half of tuition, books and laboratory fees in accredited courses after satisfactory completion of a course providing the employee has been with the Division for six months and the course was taken outside of regular working hours.

In order to keep abreast of the latest training information available, the Training Supervisor maintains an active membership in the American Society of Training Directors and the Industrial Training Council of New York State.

8. Counseling Service.

The Training Section provides a guidance and counseling service for all personnel concerning any educational or training program in which an employee may be interested.

2.52 Personnel Testing. In line with the growing importance

of personnel testing in industry, Training Section places a heavy emphasis on investigations and surveys to determine the adaptability of various performance and paper and pencil tests for the selection and promotion of its personnel.

To keep abreast of latest developments, the Training Supervisor has attended the one-week course given by the Personnel Testing Institute at Rensselaer Polytechnic Institute.

More and more management personnel are requesting that personnel tests be given to better enable them to determine eligibility for advancement and/or transfer. This has shown that management personnel are becoming more aware of the value of such tests in effective personnel practices.

2.53 Suggestion System. The $ointilla $uggestion $ystem is run in accordance with the Official Rules and Regulations of the Bendix Aviation Corporation Employee Suggestion System. A brochure covering in detail the correct procedure for the submission of suggestions is given each employee when he is hired. The system provides for awards of from $5 to $1,500 for those suggestions which are accepted from other than supervisory employees and those who are required to develop suggestions in the line of duty. The amount of the award is basically equal to 10% of the net value of the savings to the Division during the first year following adoption of the idea.

After an employee fills in a suggestion blank which is available at suggestion boxes throughout the plant and in offices, the detailed flow of the suggestion once it is picked up from the box is as follows:

1. Date stamp suggestion immediately upon receipt.

2. Enter suggestion.
    A. In Control Book.
        a. Assign suggestion number.
            (1) Record on Suggestion Blank.
        b. Suggester's name and clock number.
        c. Date suggestion is received.
    B. On Monthly Report Work Sheet
        a. Number of suggestion and date received.

3. Prepare suggestion folder.
   A. Type suggestion number.
   B. Attach Follow-Up Notes Sheet.
   C. Complete Acknowledgment Letter (form letter).
   D. Check personnel and part number cards for repetition. Place note of any repetition in folder.
   E. If part number is involved, determine type of Layout and note on Suggestion Blank.

4. Refer folder to Suggestion Committee Chairman.
   A. Chairman adds suggestion number to chairman's suggestion check sheet.
   B. Reviews suggestion.
      a. Within scope of Suggestion System.
      b. Eligibility of Suggester.
      c. Edits suggestion when necessary.
   C. Selects investigators and notes on Suggestion Blank.
   D. Signs Acknowledgment Letter

5. Chairman returns suggestion folder.

   5A. PPL (Pre-Production Layout)
      a. Obtain
         (1) Print
         (2) Layout
         (3) Production schedule for 6 months
      b. Return folder to chairman
      c. Chairman presents to Committee for decision to process or reject.

6. Make out Suggestion Control Record.

7. Mail Acknowledgment Letter.
   A. Record date forwarded.
      a. Suggestion Control Record
      b. Control Book

   7A. If suggestion is accompanied by a drawing:
      a. Type assigned suggestion number on drawing.
      b. Make out requisition for required photostats.

c. Mail original of drawing and requisition to Service Department.
d. After approval, Service Department forwards to Photography.
e. Photostats returned from Photography by mail.

8. Type required copies of suggestion (one plus number of investigators).

9. Proofread copies of suggestion.

10. Make out required Investigation Reports.
A. Note personnel to whom copies are forwarded as required.

11. Staple Investigation Report, copy of suggestion and photostat (if any) together.

12. Mail to investigators.
A. Record date on Suggestion Control Record.
B. Record investigators and date reports mailed in Control Book.

13. Staple suggestion, drawing and photostats (if any) and Suggestion Control Record in suggestion folder.

14. Enter suggestion in personnel and part number cards and check off on Suggestion Control Record.

15. File folder in active file.

16. Date stamp investigation reports as received.

17. Enter date received on Suggestion Control Record and in Control Book.

18. Refer Investigation Reports (in respective folders) to Suggestion Committee Chairman.

19. Chairman analyzes reports.

20. Active suggestions reviewed weekly by chairman.

20A. Expediting processing of suggestion.
- a. Phone calls.
- b. Personal contact.
- c. Follow-Up Memo (form) forwarded if Investigation Report is not returned within 30 days.
  - (1) Complete form and mail.
  - (2) Record date mailed on Control Record and in Control Book
- d. Present to Committee for advice.
  - (1) Management personnel sit in as requested.

20B. If suggestion is still being processed after 3 months, Delay Letter (form letter) is forwarded to suggester each 3 months.
- a. Complete form and mail.
- b. Record on Suggestion Control Record.

20C. Accepted Suggestion.
- a. Follow-up on tools, layout changes, printed forms, etc.
- b. When in effect, forward Blue Follow-Up on Accepted Suggestions to Supervisor concerned for signature.
  - (1) Complete form and mail or deliver in person.
  - (2) Record date forwarded on Suggestion Control Record and in Control Book.

c. Forward entire suggestion folder to Cost Control Department for evaluation for amount of reward.
(1) Enter date forwarded in Control Book.

21. Chairman presents suggestion to Committee for consideration.

ACCEPTED

22. Make out Control Record for signatures approving payment of reward. If award is joint, so indicate and amount of each reward.
Signatures required are:
Director of Industrial Relations
Comptroller
Suggestion Committee Chairman
General Manager (if award is $100.00 or over).

23. Record award data on Control Record in suggestion folder.
A. Savings or merit award.
B. Award computation and amount.

24. Obtain approval signatures.

25. Deliver signed sheet to Payroll (Award will be mailed to Suggestion Office by Accounting Department).

26. File in Awaiting Check Section. When check arrives, refer folder to Suggestions Committee Chairman.

REJECTED

22. Chairman dictates rejection letter on basis of Investigation Reports.

23. Check personnel file to determine whether suggester is currently employed and, if so, his clock number.
A. If not currently employed, mail letter to last address in file.

24. Type rejection letter.

25. Obtain signature of chairman and mail letter.

26. Close out suggestion in Control Book.
A. Indicate rejected.
B. Date.

27. Note date of rejection on personnel and part cards.

28. Enter on Monthly Report Work Sheet.

29. Date stamp folder.

30. File in rejected file.

27. Chairman dictates acceptance letter.
    A. Determines to whom copies are to be sent.

28. Check personnel file to determine if suggester is currently employed; if so, is his clock number and shift assignment correct.
    A. When suggester is no longer in our employ, check must be forwarded by registered mail.

29. Type acceptance letter and copies (one for folder, one for Production Engineering and one for each of those presenting award).

30. Get Chairman's signature on acceptance letter and copies.

31. Deliver letter, copies and check to Department Head or Superintendent.

32. Close out suggestion in Control Book.
    A. Indicate accepted.
    B. Date.
    C. Amount of Award.
    D. Type of Award.

33. Enter on Monthly Report Work Sheet.

34. Note date and amount of award on personnel and part cards.

35. Date stamp folder and Suggestion Control Record.

36. File in accepted file.

37. Memo to Master Mechanic.
    A. List of awards.
    B. Copies of Suggestion.

The Training Supervisor as Chairman of the Divisional Committee and presently Secretary of the Corporate Suggestion Committee is in a position which permits him to

work toward the improvement of the efficiency and effectiveness of the Suggestion System by promotional programs and streamlining procedures.

2.54 Plant Publication - "The Scintillator". "The Scintillator" has served as the "house organ" since 1942. Published once a month it records important Scintilla and Bendix activities, acts as a medium for distributing information to employees and enhances good community relations. As Managing Editor of "The Scintillator", the Training Supervisor supervises its planning, production and distribution. He is guided in these duties by NOTICE number 14 of November 1, 1952, which has for its subject: THE SCINTILLATOR - "A Statement of Policy and Objectives".

Under the Managing Editor there is the Editor of "The Scintillator" who performs the detailed work on the publication. His duties and responsibilities are as follows:

A. Collect news and feature material from various management and employee sources throughout the plant.
B. Plan and write copy for publication in plant magazine.
C. Edit all copy and pictures submitted for publication, maintaining at all times a close check on content.
D. Prepare a tentative story schedule each month, using care to arrive at a finished magazine which will have editorial balance.
E. Work in close proximity with plant photographers - plan all illustrative matter to give appeal to various articles, contact models and arrange photos in advance of actual photography, pose models and other elements in a manner which will tell the best story.
F. Crop all photos prior to layout, eliminating all undesirable elements which serve to detract from central interest.
G. Give photos same close editing as type copy, making sure no photos advertise safety hazards or show model in an uncomplimentary pose.
H. Proofread type proofs upon arrival from printer, checking carefully for mistakes, battered type, smeared letters, etc.
I. Following correction of proofs, accomplish finished layouts - pasting in on layout sheets photos, text matter, art work and headings in a manner which will create a smooth reading, colorful and appealing blend of all the various layout elements. Inasmuch as this is the finished copy the printer works with, layouts are accomplished in a precision-like manner - lining up all items with a rule and T-square.

J. Following final okay on layouts, take layouts to printer and discuss with him all production details involved in obtaining best possible magazine. At this time make any last minute corrections or adjustments that may be necessary.

K. Revise mailing list each month and maintain close contact with mailing operation to make sure magazines are properly processed with expediency upon delivery at plant.

L. Insofar as possible, stop all problems at desk level of the Editor - employing at all times tact and diplomacy whenever problems involve other individuals. When problems are of a nature that are beyond the Editor's scope of responsibility, check matters with Managing Editor for decision as to course of action to follow.

M. Personally handle all clerical details such as correspondence, filing, typing, etc., involved in connection with plant magazine.

N. Read daily newspapers and weeklies, making particular note of items which directly or indirectly pertain to Scintilla and the successful operation of this organization.

O. Analyze contents of approximately 30 different house magazines each month, seeking to determine various trends in the industrial editing field.

P. Maintain contact with other working editors through membership in the American Association of Industrial Editors and the Upstate New York Council of Industrial Editors. Attend meetings of these groups and take part in work shops, discussion groups, etc. Through these contacts, add measureably to own knowledge of techniques required by the rapidly changing field of communications.

Q. Attend various management informational meetings for purpose of obtaining news material and also background information which will be helpful in slanting particular features.

2.55 Public and Employee Relations. In connection with a vigorous program of public and employee relations the Training Supervisor performs the following functions:

A. Responsible for all tours and groups through the plant.
   1. Make necessary arrangements.
   2. Welcome and give talk to groups.
   3. Serve as guide.

B. Supervise and co-ordinate all press releases and other public relations activities such as distribution of "Bendix Aviation Corporation and Your Future" to all area public schools.

C. Present talks to school groups, service clubs, parent-teacher organizations and other community groups. Arrange for speakers.

D. Assist in programs for groups when Scintilla acts as host.

E. Assist in Open House, Sidney Chamber of Commerce Scintilla Night, and similar special projects and activities.

F. Act as advisor to employee groups such as Industrial Study Club, Blue Badge Club, etc.

G. Work with community groups in arranging programs, using Scintilla audio-visual equipment.

H. Special projects such as Register and Vote Campaigns, Scrap Reduction Campaigns, etc.

## 2.6 Summary of Recommendations.

1. Review and re-organize the procedure and policy publications.
2. Institute a formal merit rating program.
3. Establish employment ceilings.
4. Place a receptionist ahead of the Employment Interviewer.
5. Institute follow-up interviewing.
6. Review and simplify personnel records.
7. Increase the emphasis on the Management Development Program.

# CHAPTER III - PLANT PROTECTION

3.1 Divisional Security Officer. The Divisional Security Officer working under the General Manager is responsible for directing and supervising the following activities:

a. Plant Security.
b. Plant Protection.
c. Medical Bureau.
d. Safety Program.
e. Mail Room.
f. Communications.
g. Central Files.
h. Management representative in matters relative to the operation of the Division's cafeteria and concession.

3.11 Plant Security. Plant security is primarily concerned with safeguarding U.S. Government classified information. All phases of plant security include such various activities as control of security clearance of Divisional personnel, coordination of security matters with cognizant military department and facilities, identification card control for Divisional personnel and lock and key control for files and areas throughout the plant.

To guide and explain the plant security program there is published by Scintilla a "Security Manual".

3.12 Plant Protection. The plant protection force under a Captain, Plant Guards, is primarily concerned with protecting the interior and exterior of Division buildings and grounds and in safeguarding pertinent data relating to manufacturing and engineering. Other areas of its activity include employee and visitor identification processing, fingerprinting records, control of vehicular traffic, industrial civil defense emergency organization and fire protection. As a guide to personnel, Scintilla publishes a "Plant Protection and Emergency Organization" booklet which outlines in detail the people in and duties of the following:

a. Plant guards.
b. Medical staff, medical aids
c. Emergency guards

d. Plant wardens
e. Demolition squads
f. Rifle squads
g. Emergency squad
h. Fire brigade
i. Automotive equipment and personnel
j. Emergency equipment and location
k. Rescue squad
l. Radiological, communications (races), Civil Air Patrol (CAP)
m. Ground observers

To aid him in administering his plant protection program the Divisional Security Officer maintains a large scale layout of all guard stations, fire stations, patrols, flood lights, sprinkler risers and clock stations.

Every effort is made to comply with such directives and information as put out by the federal and state governments in such pamphlets as:

"Standards for Plant Protection", issued by the Department of Defense, Munitions Board, Office of Industrial Security.

"Federal - Civil Defense in Industry and Institutions".

"United States Training Course for Civil Defense".

"United States Civil Defense Health Services and Special Weapons Defense".

"Industry Guide to Planning Restoration of Production".

"Industrial Plant Protection with New York State Civil Defense".

"Code 38, New York State Department of Hygiene", (refers to possession of radioactive material).

As an indication of how well Scintilla accomplishes its plant protection goal, it is interesting to note that it is the only company in New York to receive four awards for Industrial Civil Defense from the State of New York.

3.13 Medical Bureau. The Medical Bureau has the responsibility for employee health, group insurance, compensation insurance and the medical clinic.

The Bendix Aviation Corporation Group Insurance Plan covers employees and their dependents, at the employee's option, who have been on the payroll three months or more. It includes hospital, surgical, and medical benefits for employees and their eligible dependents. Both employees and the Company contribute to the plan which is underwritten by The Travelers Insurance Company. Details of the plan are included in a special booklet given to all employees.

In the event of an injury to a person while working, the employee is covered by Accident Insurance carried by the Company and in accordance with the provisions of the New York State Compensation Law.

The Division Security Officer, through the Supervising Nurse, handles the Group Insurance, Workmen's Compensation and First Aid. To assist her there are six nurses and two clerks. There are two doctors on call in addition. To provide thorough medical coverage there are four nurses on the first shift, two on the second and one on duty for the third shift.

3.14 Safety Program. Under the Divisional Security Officer the Safety Program is implemented through a Safety Engineer and Senior Clerk. Safety equipment such as safety shoes, safety glasses, respirators, protective creams, etc., are however, issued in the First Aid Room. Graphical analyses of accident frequency rates and severity rates are maintained by the Safety Engineer. Incidentally, these graphs show a favorable downward trend. Interest in the Division's Safety Program is stimulated by a profuse use of safety posters and safety slogan contests. Furthermore, all personnel receive safety pamphlets and each foreman is given a large 200-page book, "Handbook of Industrial Safety Standards" which is provided by the Fidelity Casualty Company of New York. As a member of the National Security Council, much material is received and collated in a Safety Library.

3.15 Mail Room. Working for the Divisional Security Officer the Supervisor of Mail Room and Stationery Stores is responsible for the following activities:

a. Control of incoming and outgoing U.S. Mail and Plant Inter-Office Mail.
b. Stationery - purchasing and stores.
c. Reproduction of literature, forms, etc., by miltilith, ditto or mimeograph.
d. Control of Mailing Lists and Employee Attendance Cards.
e. Initiates procurement of office furniture, fixtures and machines, and
f. Archives and vaults (storage records).

3.16 Mail. In order to insure that the U.S. Mail is at the Division at 0800, some of the drivers work from 0700 to 1530. Following this 0800 delivery to the Division, outgoing mail is taken to the U.S. Post Office and another pickup is made at 0915. There is no further mail pick-up due to train schedules but mail is delivered to the Post Office at 1315, 1600 and 1645.

Mail delivered to the Division mail room is sorted by departments, offices, and shops for delivery throughout the Division. Some mail is opened prior to delivery and some is not, depending on instructions to mail room personnel. As a precaution against inadvertently leaving material in envelopes which are opened in the mail room, all envelopes are checked three times during the period of one week that they are retained before being discarded.

There are office and shop pick-ups and deliveries of U.S. and Plant mail at the following times:

0915 Office route
1030 Shop route
1115 Office route
1345 Office route
1430 Shop route
1615 Office route

There are deliveries every one-half hour between the accounting offices (which are located three-quarters of a mile away) and the Division. Mail between Montrose and Scintilla is handled by Division trucks every Tuesday and Thursday.

In delivering mail within the Division; mail is carried around the various established routes in carts similar to those used in grocery super-markets. It was noted

that a large majority of the incoming and outgoing baskets on desks and cabinets were not marked to indicate their use. Baskets were of several varieties and there was little consistency as to their location. It is felt that it would be advantageous to label all desk baskets to eliminate any possible confusion as to their purpose. In the interests of standardization it might be convenient to adopt as a general rule the procedure of having the outgoing basket on top and the incoming basket on the bottom of the two-basket stack. This is the way the majority of the two-basket stacks are now arranged.

The expense involved in these suggestions is negligible and the only objection appears to be that this standardization is too detailed.

To assist the Supervisor, Mail Room and Stationery Stores, in all his duties there are eleven employees. As an indication of the volume of mail handled it was determined that there have been as many as 2200 envelopes of incoming U.S. mail in one day and the monthly outgoing first-class mail averages about ₱2,000.00 in postage fees.

3.17 Communications. The Divisional Security Officer is responsible for the proper handling of telephone, telegraph and teletype messages and equipment (switchboards, handsets, teletype and telegraph machines) and communication charges. A communication chief and seven experienced operators handle these daily communications.

3.18 Central Files. Operating under the cognizance of the Divisional Security Officer, the Senior Clerk in Central Files with the aid of two assistants is responsible for the proper filing of correspondence, customer's orders and related operating forms.

The central file room receives a yellow and a pink copy of pertinent correspondence. The yellow copy is filed chronologically on a daily basis and retained for six months. This requires only one drawer of a standard five-drawer filing cabinet. The pink copy is filed according to the company or individual with whom the Division is dealing. These copies occupy about 17 drawers of space and the copies are retained 7 years. The balance of 50 filing cabinets in central files contains primarily purchase orders and invoices filed by a code number which the Billing Section assigns to each company or individual.

3.19 Management Cafeteria Representative. The Divisional Security Officer is Management's Representative in dealing with the concessionaire who manages the Division's cafeteria. He is primarily interested in assuring for Management and Divisional employees the proper operation of the cafeteria under reasonable financial arrangements.

3.2 Summary of Recommendations.

1. Label and standardize office desk baskets according to their purpose.
2. Give careful consideration to the proposal of moving Safety, Medical, Cafeteria Representation, Security, and Plant Protection to the Industrial Relations Department as suggested in Section 1.39 and 1.390.
3. In connection with the establishment of the position of Office Manager as recommended by Sections 1.38, 5.4 and 5.5, Mail, Communications and Central Files Sections should fall under his cognizance.

# CHAPTER IV - PLANT PROPERTY

4.1 General. The primary function of this department is supervision of the erection, care, maintenance and alteration of buildings and properties. This includes liaison and co-ordination between the Division, the Corporate real estate executive in South Bend, Indiana, and the Corporation's Architecture and Engineering firm in Detroit, Michigan. This department carries out all contacts and negotiations in the realm of real estate and buildings with other business firms and city and state government agencies. Changes, inspection and acceptance of construction and alteration projects come within the purview of the Supervisor, Properties and Facilities, head of this department.

A secondary function of the department is responsibility for operation of all piping systems in the plant. This includes the boiler room and heating, water, propane gas, air and sprinkler systems.

4.2 Recommendation:

It is recommended that the Plant Property Department be transferred under the Plant Engineer in the Manufacturing Department in accordance with Section 1.33 of this report.

# CHAPTER V - OFFICE PROCEDURES

5.1 General. Although time permitted only a cursory investigation into only part of the offices in the Division, there were evident several items which seem worthy of note. In general, it was found that procedures for performing the same function differ in the several offices. This leads to the obvious conclusion that since not all ways can be equally good, some offices are performing some functions more efficiently than are other offices. An example here may be found in the use of "mail logs", or correspondence records, as discussed in Section 5.22. A concerted effort at standardization, then, should be of benefit if the best way is sought for the standard way. There are, of course many advantages in standardization, for example the concomitant ease of inter-office transfer of personnel.

## 5.2 Correspondence.

5.21 Routing. The usual procedure is for mail from the central mail room to be delivered to one secretary in each office. This secretary sorts and distributes the mail within the office. In some cases some of the mail is given to an upper level supervisor who marks it for routing. Route sheets are not used although some of the offices make use of a rubber stamp for this purpose. This rubber stamp, while it could doubtless serve in some cases as an adequate substitute for a separate route sheet, was not performing well since the people involved were not always making the proper annotations. The purpose of the route sheet is to provide a record of where a piece of correspondence has been, for how long, who has seen it and what action has been taken. A second purpose, served by keeping duplicate route sheets and by returning the correspondence to a central recording point each time it changes hands is keeping track of who holds any particular correspondence at any given time. Appraisal of results of a trial run involving perhaps ten or twenty pieces of mail per week could reveal whether route sheets might be used advantageously.

5.22 Mail Logs. The practice of recording incoming and/or outgoing correspondence is one of proven value. However, since there is a significant amount of work involved in keeping the logs, the advantage of having these records available

must be weighed against the effort to be expended. Their worth is a function of the amount of correspondence involved and the number of times it is necessary to check on whether and when a certain piece of correspondence has been received or dispatched. Inquiry into several of the offices of the Division revealed that those who keep mail logs consider them indispensable while those who do not keep logs feel that keeping them would be of relatively small use and would pose such a problem as to be insurmountable without hiring additional clerks for this purpose.

5.23 Office Files. The decision in most cases as to where copies of correspondence should be filed appears to be left to the person working with the correspondence or to the secretary involved. The practices of the various offices with regard to whether a particular piece of correspondence should be filed in the office files, the central files, or both are not consistent one with another. This could be covered in the handbook discussed in Section 5.32.

## 5.3 Stenographic Employees.

5.31 Work Time Statistics. The statistics presented in Chart 5-1 are the result of a questionnaire which requested each secretary, stenographer, clerk, intermediate clerk and junior clerk to estimate a breakdown, into the functions shown in the chart, of how he spends his time. Though more accurate results might be attainable through exhaustive observation or work sampling programs, it is felt that the employees know how they spend their time and, since no attempt was made to determine non-work time nor efficiency of working time, there was no reason to give other than honest estimates.

The figures in the columns marked "Weighted Percentage" are weighted in accordance with the number of employees involved. For example: replies were obtained from 19 Service Department employees and the average time spent taking dictation was 13% (average of all nineteen); thus, the weighted figure in the chart for Service Department employees taking dictation is 19x13 = 247.

No clear and obvious recommendation presents itself in the tabulation of Chart 5-1 but a sufficient amount

Chart 5-1

Distribution of Working Time - In Percent

| Department | Taking Dictation | | Transcribing Dictation | | Other Typing | | Maintaining Files | | General Duties | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Avg. % | Wgt'd. % | Avg. % | Wgt'd. % | Avg. % | Wgt'd. % | Avg. % | Wgt'd. % | Avg. % | Wgt'd. % |
| Traffic | 1 | 10 | 1 | 10 | 84 | 840 | 1 | 10 | 13 | 130 |
| Manuf'ing. | 4 | 236 | 5 | 295 | 29 | 1711 | 21 | 1239 | 41 | 2419 |
| Ind. Rel. | 7 | 56 | 10 | 80 | 39 | 312 | 15 | 120 | 31 | 248 |
| Qual.Cont. | 1 | 7 | 3 | 21 | 40 | 210 | 21 | 147 | 35 | 245 |
| Plant Protection | 1 | 13 | 1 | 13 | 27 | 351 | 23 | 299 | 48 | 624 |
| Eng'ring. | 4 | 172 | 5 | 215 | 23 | 989 | 9 | 387 | 59 | 2537 |
| Service | 13 | 247 | 19 | 361 | 27 | 513 | 15 | 285 | 26 | 494 |
| Acct'ng. | 1 | 38 | 1 | 38 | 24 | 912 | 6 | 228 | 68 | 2584 |
| Sales | 11 | 220 | 12 | 240 | 36 | 720 | 9 | 180 | 32 | 640 |

Chart 5-2

Employees Included in Chart 5-1

| Department | Total (Weight) | Junior Clerk | Intermed. Clerk | Clerk | Stenographer | Secretary |
|---|---|---|---|---|---|---|
| Traffic | 10 | 9 | 1 | | | |
| Manufacturing | 59 | 19 | 19 | 5 | 10 | 6 |
| Ind. Rel. | 8 | | 3 | | 4 | 1 |
| Qual. Cont. | 7 | | 6 | | | 1 |
| *Plant Protection | 13 | 4 | 8 | | | 1 |
| **Engineering | 43 | 11 | 6 | 9 | 11 | 6 |
| Service | 19 | | 2 | 1 | 14 | 2 |
| Accounting | 38 | 9 | 27 | | 1 | 1 |
| Sales | 20 | | 3 | | 15 | 2 |

Chart 5-2

**Includes clerks in library, posting design changes, making, trimming and distributing blueprints.

*Excludes mail clerks, receptionist, P.A. system operator, stock clerk.

of time is shown as being spent in shorthand and typing that it may be worthwhile to consider the possibility of utilizing a stenographic pool, preferably in the form of a Division pool. Such a pool would best be a section under the Office Manager discussed in Section 5.4.

5.32 Stenographer's Handbook. The Division does not have a stenographer's handbook though the Service Department has an excellent beginning. Such a handbook is most desirable both as a training manual and as a reference manual in which capacity it will save time and foster standardization and efficiency. As many secretarial and stenographic tasks as possible should be detailed in the handbook, especially those which are in some way peculiar to the Division.

Preparation of any such handbook must necessarily be a large order and making sure it is well and properly used rather than just "filed" is sometimes a problem also. The method of preparation suggested here is designed to get the assistance of the best qualified people in preparation and to insure the interest of top level supervisors without whose interest and cooperation almost any program is foredoomed. A committee of about six top level secretaries, under the direction of the Training Supervisor, should meet for at least two hours twice a week to decide what should be included in the handbook and to prepare it. Top level secretaries are surely qualified to say what should be included in the handbook and "top management" can hardly fail to evince interest in something that is taking their secretaries away from their jobs for a significant amount of time. The preparation of the handbook would doubtless serve excellently as a review of present office procedures.

5.4 Office Manager. It is recommended in Section 1.38 that an Office Manager position be established in the Division. The investigation, adoption and administration of the recommendations in this chapter could best be implemented through such a position. It is doubtful whether any program of standardization of office procedures could be successfully undertaken except under a single administrator who would have continuing cognizance of the various phases of day-to-day work involved. The same holds true for the discussion above in regard to a stenographic pool and a stenographer's handbook.

## 5.5 Summary of Recommendations.

1. Standardize office procedures.
2. Undertake a test run to determine the advisability of using correspondence route sheets.
3. Investigate the use of mail logs on customer and other significant correspondence. No effort should be made to log advertising and other routine matters.
4. Institute standardized filing procedures.
5. Consider the development of a stenographic pool.
6. Develop a Stenographer's Handbook.
7. Establish the position of Office Manager.

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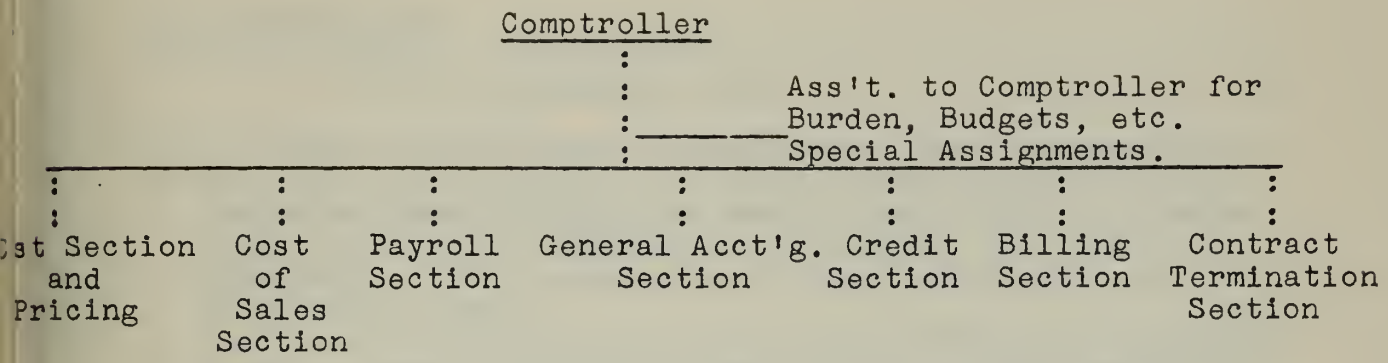
# CHAPTER VI - ACCOUNTING DEPARTMENT

6.1 General Discussion. Some background information is necessary to the proper viewing and comprehension of the accounting procedures and methods of the Scintilla Division of the Bendix Aviation Corporation. Scintilla operates as a semi-autonomous Division of the Corporation. The control of the financial and accounting procedures is exercised by the Corporation. The Divisional Comptroller is subject to Staff direction from the Corporate level.

Scintilla's primary business has traditionally been the manufacture and assembly of components for aircraft engine ignition systems, diesel engine components, and more recently, electrical connectors. These fields are dynamic, with products subject to rapid engineering change and obsolescence. Approximately 87% of the Division's business is with agencies of the U.S. Government.

The accounting system presently in use is a combination actual job costing and a standard costing system. Scintilla considers that such a combination system is necessary to meet their needs, due to the intermittent repetitive nature of their business and the varying quantities of their orders. Job costing (contract costing) is employed to check on the actual cost of each job and is considered necessary due to the variety of jobs and prevalence of non-standard items for which no labor standards exist. Standard costing is used for direct labor on most manufacturing operations due to better cost control afforded. Direct materials are priced at average cost, but are computed for standard quantity per unit. A complete standard costing system is used for electrical connector products, with the distinction here made because it is the one product made almost solely to own specifications and it has a constant flow.

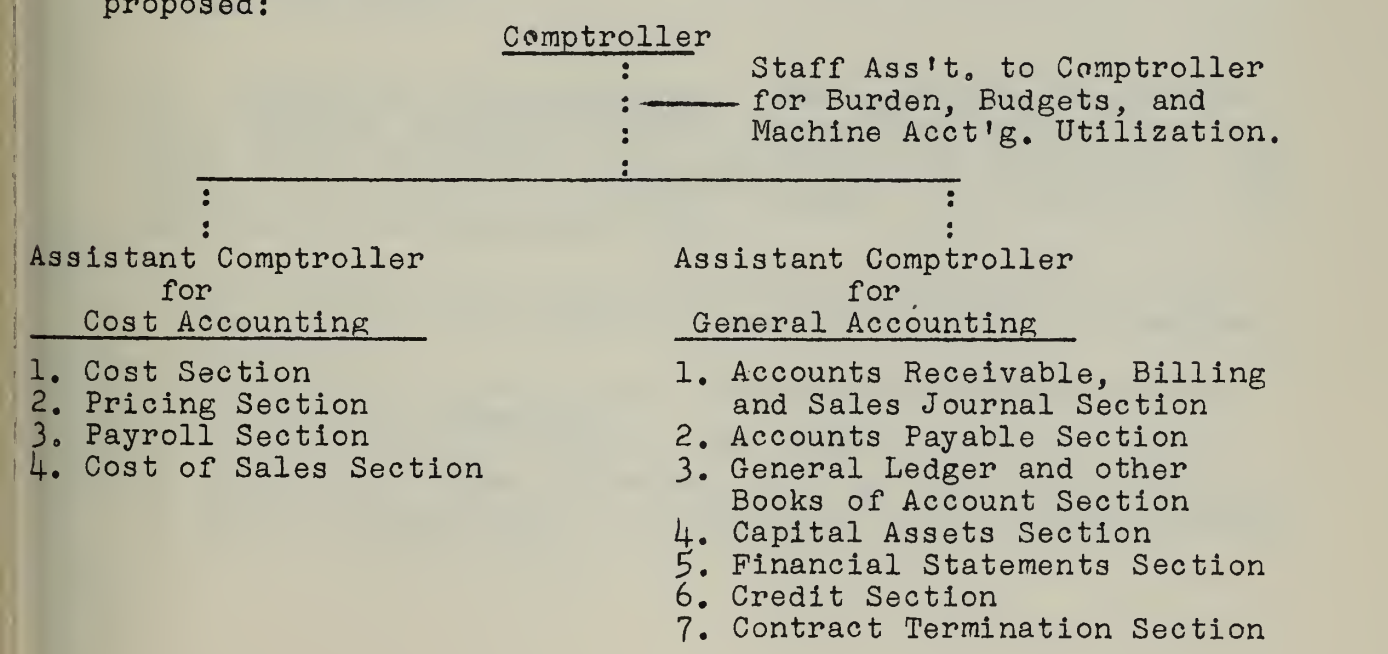
6.11 Organization of Accounting Department. The Divisional Comptroller presently has nine persons reporting to him. Of these, three have titles, "Assistant to the Divisional Comptroller" and have functional duties similar to the remaining six section supervisors. The Department is generally organized on a sectional basis, with each section responsible for a certain specific function. The present organization chart is as follows:




Comments:

With the exception of a clearly defined chain of authority below the Comptroller, the existing organization appears to work harmoniously and efficiently. Some lag in communications is necessarily occasioned by the physical separation of some of the sections in buildings removed from the central offices. Again it is felt that some of the sections with closely allied functions could be combined for greater economy of operation. Specifically, it is felt that the Billing and Sales Journal Sections could be combined under the General Accounting Section.

From a long-range viewpoint and considering the expected increase in the Division's volume of business and extension of machine accounting techniques (such as IBM) throughout the Department, the following organization is proposed:


Comptroller
Staff Ass't. to Comptroller for Burden, Budgets, and Machine Acct'g. Utilization.
Assistant Comptroller for Cost Accounting
1. Cost Section
2. Pricing Section
3. Payroll Section
4. Cost of Sales Section
Assistant Comptroller for General Accounting
1. Accounts Receivable, Billing and Sales Journal Section
2. Accounts Payable Section
3. General Ledger and other Books of Account Section
4. Capital Assets Section
5. Financial Statements Section
6. Credit Section
7. Contract Termination Section

Recommendations:

It is recommended that:

1. A current Departmental Organization Chart be developed.
2. That Job Descriptions be prepared and provided for all positions down through the section head level. If such descriptions are presently in existence, they are not apparently in the possession of the Staff Assistants or the Section Heads.
3. Sufficient space be allocated in the Division's expansion plans to permit physical consolidation of the Department at the Central Offices. Improved communications and more economical use of equipment should result therefrom.
4. The Billing and Sales Journal Sections be combined with the Accounts Receivable unit of the General Accounting Section. Similarity of functions should facilitate such a merger with attendant personnel and equipment economies.
5. That for long-range planning purposes (i.e., with a five-year period) the Department be organized into two major sections -- a Cost Accounting Section and a General Accounting Section, with each section headed by an Assistant Comptroller. A Staff Assistant to the Comptroller would also be provided for computation of burden rates, budgets, study of machine accounting techniques and other miscellaneous duties as considered necessary by the Comptroller. Such an organization would reduce the present span of control of the Comptroller, provide a more clear-cut organization and better defined chain of authority within the Department.

6.2 Office of the Comptroller. The Accounting Department is a separate department of the Scintilla Division, with the head of the Department being the Divisional Comptroller. He reports directly to the General Manager of the Division. The Comptroller is responsible for :

1. Supervision and formulation of all accounting procedures for the Division within established policies of the Corporation.
2. Direct the preparation of financial statements for the guidance of management.
3. Analysis and appraisal of the financial results of the operations of the Division.
4. Approve expenditures as authorized by the General Manager or the Corporation.

In addition to the above administrative responsibilities, theOffice of the Comptroller (through an Assistant to the Comptroller) performs the following operational functions:

1. Preparation of the annual forecast of burden rates.
2. Preparation of the annual forecast of income, profit and loss.
3. Evaluate all items sent on consignment and charge to the proper account.
4. Prepare the breakdown of all purchases and sales by product.
5. Determine the profit or loss on government contracts subject to re-determination, and re-negotiate where appropriate.
6. Accounting for intracompany transactions.
7. Preparation of budget and submission of budget reports as required.
8. Review of and submission of tool and other capital appropriation requests to the Corporation.
9. Preparation of the "Exempt Payroll".

Comments.

The various forecast statements, such as the forecast of burden rates, annual forecast of profit and loss, sales and profits by product are all prepared in this office by an Assistant to the Comptroller. These statements constitute a most important managerial tool in that they provide a basis for present action and future planning. Essentially, these statements are all based on the annual forecast of sales, which is carefully weighed and considered by the Sales Department, Comptroller and General Manager before being finalized. Actual results are compared with the forecasts from month to month, with the forecasts being revised as experience dictates. It is considered that management is provided adequate data upon which to base future plans, with timely checks against actual results quickly reflecting any change in expected trends.

6.21 Manufacturing Burden. The Scintilla Division presently has four separate cost-product centers as follows:

Cost Center "A"--To which is charged all manufacturing burden incurred on all aircraft and other high precision products (designated by series 1, 3, and 800,000 contracts).

Cost Center "B"--To which is charged all manufacturing burden incurred on "Plug-in-Connector" products (designated by series 500,000 contracts).

Cost Center "C"--To which is charged all manufacturing burden incurred on outboard motor magnetos and tractor magnetos (designated by series 600,000 contracts).

Cost Center "D"--To which is charged all manufacturing burden incurred on small aircraft and commercial magnetos (designated by series 400,000 contracts).

The Engineering Department establishes which product is applicable to which product-cost center, using the criterion of degree of manufacturing precision required for a particular product. This is strictly an engineering decision.

The actual computation of manufacturing burden is accomplished by the Assistant to the Comptroller, and originates with the forecast of sales for the succeeding year prepared by the Sales Department. This forecast is carefully weighed by top management and approved by the General Manager before being finalized. The forecast is then segregated by product-cost centers A, B, C, and D as determined by the forecast sales of products applicable to those centers.

The amount of direct labor and direct material is then determined by Department. Each productive department is then broken down into individual items of estimated expense, both variable and non-variable (as distinguished from fixed expense). These expense estimates are based on direct labor dollars and non-variable expense estimates. Total non-productive department expense estimates are based on sales and direct labor requirement estimates. Each expense category of productive and non-productive departments is then combined to arrive at an estimated total expense by category. The summation of these totals together with fixed charges provided by the General Accounting section is then the total manufacturing burden. The allocation of burden between cost centers by individual category of expense is predicated on various bases, such as direct labor required by the cost center, direct materials required by the cost center, or manufacturing experience. The ratio of this burden to the estimated direct labor requirements in dollars for each cost center becomes the burden rate for that center.

Manufacturing burden is charged to appropriate cost center products on the basis of direct labor dollars. All burden rates have to be approved at the Corporate level, and remain constant for the year.

Comments:

The present method of product-cost centers established on the basis of degree of manufacturing precision required seems equitable and representative of actual overhead costs accruing to specific products. The primary consideration here is that products are properly classified for cost center purposes so that misleading costs cannot distort the product cost picture on a full costing basis. Such mis-classification could lead to unsound conclusions as to the profitability of a particular product. Except for this susceptibility to mis-classification, and the difficulty that must exist in classifying border-line cases, and the difficulty that must be experienced in controlling costs on a cost center basis, this method of cost center determination seems satisfactory.

While time did not permit investigation of the detailed breakdown of the many items comprising burden between the several cost centers, those items which were analyzed, such as inspection and material handling costs, seemed equitably and logically distributed to the applicable cost centers.

6.22 Budgets.

Manufacturing. The annual budget for the manufacturing departments is prepared by the office of the Comptroller concurrently with the computation of manufacturing burden, and is based on the forecast of sales. Estimated variable and non-variable (as distinguished from fixed) expenses are based on direct labor requirements dictated by the sales forecast. Departmental expense estimates are identical with those used for burden computation, and become the departments operating budget. The budget is variable in the sense that variable expenses are directly related to the volume of production and fluctuate in consonance with it.

Engineering. The Engineering Department budget estimates are drawn up by the Engineering Department. Estimates are prepared both for new developments and engineering improvements on existing products. Estimates are developed by

projects and are costed on that basis. Control over engineering expenditures is based primarily on historical experience, with budgets running approximately 10% of sales.

Sales. The Sales Department budget estimates are prepared by the Sales Department and again are based on historical experience. The budgeted amount is based on the number of personnel and expenses necessary to produce a certain volume of sales.

Service Department. The Service Department budget is based on past experience and is relatively constant in amount.

Administrative Departments (General Accounting, Executive, Comptroller's Office, Credit, Billing, Sales Journal)

These budgets are based on historical precedent, i.e., the expenses and number of people necessary to do the required jobs.

Budget Reports. Budget status reports showing actual expenditures, budgeted amounts and variances, both current and cumulated for the year to date, are sent to the manufacturing departments, Power Department, Inspection and Quality Control Department, and Sweepers weekly. All other Departments are provided monthly summaries. The General Manager also is provided a monthly summary.

Comments:

The procedure followed in the formulation of the manufacturing departments' budgets is an excellent one. Their variability in response to the level of manufacturing activity, with frequent advice to the manufacturing floor provides an excellent measure of cost control.

While budgetary procedure and practice is excellent, the theory upon which budgets are developed is open to some discussion. The primary yardstick in budgetary development seems to be historical past performance. Such standards provide a good reference basis, but must be used with caution, as they tend to perpetuate whatever previous errors and wasteful practices that may have existed in the past. Historical costs are only useful where they represent good past practice and they may bear no relationship to good potential performance. In a dynamic, changing field such as

that in which Scintilla is engaged, attainment of future goals should provide the yardstick -- not historical past performance. This should apply to manufacturing costs as well as engineering or sales budgets.

Recommendations:

It is recommended that:

1. "Fixed percentage" yardsticks be avoided in the development of departmental budgets, and that past historical costs be viewed only as a reference in developing budgets based on good potential performance and achievement of future goals.

6.23 Tool Appropriation Requests. Requests for new tooling appropriations originate in the Master Mechanic's Office, from where they are co-ordinated through the Engineering Department and the Superintendent of Production. The requests then come to the Office of the Comptroller and are written up on a standard Bendix intradivisional form. Tooling in the amount of $2500. can be approved at the division level. Items in excess of this are submitted to the Group and Corporate levels for approval. All tooling requests must have supporting data and be programmed for recovery of costs before approval is given. Such requests are approved by the Comptroller and General Manager.

6.24 Intra-Company Transactions. In all intradivisional purchases and sales, profit or loss is permissible only in the final transaction. Purchases from and sales to other divisions of the Corporation are charged only with Material, labor and burden components in their inventory valuation. Divisional, general and administrative expenses and profits are shown separately on the invoice and are picked up as an additional cost by the Division consummating the final sale. Intra-Divisional transactions are cleared monthly through appropriate corporate control accounts.

6.25 Sales Journal. The Sales Journal Section of the Accounting Department is headed by an Assistant to the Divisional Comptroller, and operates as an autonomous section of the office of the Comptroller. Its functions are:

1. Check sales invoices for accuracy and discount information prior to mailing to customer.
2. Check sales invoices for credit to proper sales account.
3. Compiles daily sales summaries for posting in Sales Journal.
4. Provides daily sales summaries to Accounts Receivable Section (General Accounting) and Cost of Sales Section for compilation of net sales figures.
5. Prepares monthly Sales Journal Analysis for posting to General Ledger.
6. Codes all sales orders for IBM punch cards.

All sales invoices, with attendant credit and debit memos are routed to the Sales Journal Section of the Accounting Department. These invoices consist of the customer's copy and three accounting copies. All extensions, footings and miscellaneous other information are checked. (In-correct invoices are returned to Billing Section for correction.) Cash discount date stamp is applied where necessary to customers' copies and to General Accounting copies. The customers' copies are then separated and mailed out once each day.

The accounting copy (statistical copy) of each invoice is scrutinized and appropriate account numbers are applied. IBM punch cards are then prepared for each invoice and are run once daily by the Payroll Section. A summary of the run, by account numbers is posted daily in the Sales Journal.

A copy of the daily sales summary is sent to the Accounts Receivable Section, General Accounting together with all General Accounting copies of the invoices. A report is prepared also for the Cost-of-Sales Section who compile net sales figures for purposes of profit computation. Both Accounts Receivable and Cost-of-Sales balance each day and at the end of the month with the Sales Journal figures.

Once each month, a Sales Journal Analysis is prepared and sent to the General Ledger for posting at the close of the month's business. This analysis consists of monthly totals by account numbers of debits and credits to various sales, accounts receivable, and other miscellaneous accounts.

The Sales Journal Section also codes all sales orders with information necessary for punching IBM cards.

Comments:

This section performs a necessary function, but one that could be combined with the Accounts Receivable unit of the General Accounting Section. The procedure is one that is considered to be particularly adaptable to machine accounting techniques.

Recommendations:

It is recommended that:

1. The functions of this section be adapted to machine accounting techniques and integrated into a combined Billing, Sales Journal and Accounts Receivable System.

6.26 Cost of Sales Section. The Cost of Sales Section is a separate section of the Accounting Department reporting directly to the Comptroller. The function of this section is to accumulate costs on all monthly sales to arrive at a monthly cost of sales figure with a corresponding inventory credit.

This procedure commences with the receipt of the statistical copy of the sales invoice from the Sales Journal Section. IBM cards are punched for each part number on the invoice, containing number of parts, customer, date, invoice number, account to be debited and shipping value. This card is then sent to Payroll, where it is collated with the master cost card for that particular part for standard costs of material and labor and applicable burden center. An IBM run is made monthly summarizing all sales invoices by part numbers. This summary gives standard material and labor costs and applicable burden center. Burden then is applied by the Cost of Sales Section at applicable rates.

The Cost Accounting Section then provides burden, labor and material variances which are added to standard costs to arrive at final manufacturing cost of sales. Appropriate inventory accounts are then credited and the cost of sales is charged.

To the manufacturing cost of sales is added tooling expense, engineering expense, overtime and night-shift premiums, packaging costs, cost of living allowances, inbound transportation costs, and royalties which gives the total

cost of sales for Profit and Loss. These computations are given to the General Accounting Section on the inventory adjustment journal sheets monthly for posting to the General Ledger.

6.3 General Accounting Section. The General Accounting Section comprises a separate unit of the Accounting Department, with the head of the unit reporting directly to the Divisional Comptroller. It's primary function is the maintenance of the following Divisional Books of Account:

Accounts Receivable Ledger
Accounts Payable Ledger
Voucher Register
Cash Receipts and Disbursement Ledgers
General Journal
General Ledger

In addition, the section is also responsible for the maintenance of capital asset records and capital appropriation requests, and the preparation of Balance Sheet and Profit and Loss Statements.

6.31 Accounts Receivable. Sales invoices are run daily by tabulating (Payroll Section) from cards punched in the Sales Journal Section, and forwarded to the General Accounting Section. This run gives the charge to be made to each customer's account. General Accounting likewise gets copies of the Sales Invoices. These are posted to the Accounts Receivable ledger card and the customers statement at the same time. A monthly analysis of accounts receivable is prepared by tabulating at the end of each month for check purposes, and statements are then mailed to customers. A reserve for bad debts of 3/4% of sales is charged to administrative expense monthly.

6.32 Accounts Payable. Incoming material is received in the Receiving Section, where it is checked against the invoice for overages or shortages. It is also sampled by the laboratory for adherence to specifications. Inspection reports are prepared, detailing discrepancies if any. Upon receipt of the material, a receiving report is made out and forwarded to the General Accounting Section. The invoices and Bills of Lading also come to General Accounting.

A card record is made for each invoice, which constitutes the accounts payable ledger. This card is matched against the receiving report to ensure actual receipt of the material, and against the inspection report to pick up any discrepancies. Invoices are likewise checked against the purchase order, on which is recorded the receipt of lots of material. Invoices are checked for price and discount terms, and the appropriate account is charged for receipt of the material and accounts payable is credited. If the invoice and account is in order, a payment voucher is prepared, audited, and approved for payment. The voucher is then entered in the voucher Journal as a charge against the proper account and is paid by check.

The accounts payable card ledger is not a complete accounts payable ledger in the sense that cards are not prepared for minor items, and only appear in the books as a cash disbursement when paid. All payments are entered in the cash disbursements ledger when paid, with appropriate notation to the vouchers payable ledger and accounts payable cards.

6.33 General Books of Account. All journal information is summarized monthly and posted to general ledger accounts. The voucher register, cash receipts, cash disbursements, and general journal data all originate in the General Accounting Section. The inventory disbursement journal data from which monthly inventory adjustment entries are made by General Accounting originates in Cost of Sales, Payroll and Cost Accounting Sections. Other applicable data is collected from the Payroll Section and the Sales Journal Section. Engineering expenses (less any engineering income) are charged monthly to Cost of Sales. General Journal entries usually encompass only miscellaneous items not applicable to entry in the general ledger through the specialized books of account.

6.34 Capital Assets. The Scintilla Division does not use a capital appropriation budget as such. Instead, appropriation request forms are originated by the Department concerned as needed. This request must fully justify the need for capital funds, and is processed through the appropriate chain of authority and approved by the General Manager. This form then goes to the General Accounting Section, where a standard Bendix Corporation appropriation request form is prepard for submission to the Corporation. Upon approval by the Corporation

a purchase order is prepared and the machinery or equipment is ordered. Upon receipt of the equipment, an equipment card is prepared establishing the monthly depreciation charge. Depreciation entries are made to capital asset accounts monthly, based on a straight line depreciation basis at rates established by Corporation policy. Assets are depreciated at the following rates:

Machinery--10% annually
Materials Handling Equipment--6% to 18% annually
Furniture and Fixtures--12½% annually
Automotive and Aircraft Equipment--25% annually
Buildings--Depreciation based on a 33-year life

It is noted that repair costs on specific pieces of equipment are not kept on the equipment records unless such repair extends the life or capacity of the equipment, when it is capitalized. It is considered that all repair costs should be accumulated on the equipment cards, as such information is valuable in determining the point at which an individual piece of equipment outlives its economic usefulness and should be replaced.

6.35 Financial Statements. Financial statements consisting of Balance Sheet and Profit and Loss Statements (with supporting data) are submitted monthly to the Corporation. These statements are prepared by the General Accounting Section from general ledger balances. Other statements for the use and guidance of management are prepared in the office of the Comptroller as noted above.

Comments:

Most of the work of this section is conventional bookkeeping in the sense that it represents the collection of financial data from other sections of the Department for posting to the books of account of the Division. Such procedures of necessity require considerable clerical work. It is considered that the application of machine accounting techniques to this section, particularly in the Accounts Receivable and Accounts Payable areas would result in a substantial reduction in clerical effort.

The financial statements are conventional in nature. In the Profit and Loss Statement, material, labor and burden variances are handled as products costs, being combined

in the total cost of goods sold figure. The fact that Scintilla uses actual job costing in addition to standard costing provides the ability to tie these variances to individual jobs, which is desirable in government contract work where contracts may be re-negotiable. Over or under absorbed burden is handled as a period cost, as are sales and other commercial and administrative expenses. The approach to this statement seems to be a realistic attempt to portray management's best estimate of the profits made for the particular period concerned -- not necessarily profits made on the goods sold during that period.

On the Balance Sheet, an item worthy of comment is the size of the monthly charge to administrative expense for the Reserve for Bad Debts. 3/4% of monthly sales is charged for bad debt expense. In view of the Division's bad debt history, which has been negligible in amount, this rate of charge-off seems excessive. It is understood that this rate is dictated by Corporation policy.

It is likewise noted that depreciation policy is based on a straight line basis. In view of ever rising costs and prices during the past two decades, it is considered that a policy that would charge off a greater percentage of the value of the asset in the early years of its life, (such as the Sum of the Years Digits) would be more realistic and provide a greater reservoir of funds for equipment replacement or other corporate capital requirements.

Recommendations:

It is recommended that:

1. Machine Accounting techniques (such as IBM) be adopted in the General Accounting Section, particularly in the Accounts Receivable and Accounts Payable Areas. It is considered that greater efficiency and savings in clerical labor would result.

2. If Corporate policy will permit, it is recommended that:
   A) Reserve for Bad Debts charges be reduced to more closely reflect actual bad debt experience.

   B) Depreciation policy be changed from present straight line method to a method more representative of actual decrease in asset value, such as the Sum of the Years' Digits.

3. If repair cost histories for individual pieces of equipment are not now retained and compiled elsewhere, that such records be kept by the General Accounting Section as an aid in determining when equipment has reached the end of its economic usefulness and should be replaced.

6.4 Payroll, Bond, and Timekeeping Section. The Payroll Section comprises a separate unit reporting directly to the Comptroller. The major functions of this section are:

1. Payroll preparation and administration.
2. Timekeeping data compilation.
3. Provision of machine accounting data as requested.
4. Disbursement of petty cash.

In common with the great majority of the functions of this section, the payroll records are prepared and maintained by IBM tabulating machines, utilizing punch card techniques. The payroll is prepared as follows:

Job tickets are prepared by all employees on productive labor contracts. These cards contain a record of the time spent by the employee on a specific job, verified by the authorized inspector. Any change in operation, part number, or contract requires a new card. These cards are collected daily by the payroll section. When the payroll is being prepared, a gross earnings card is prepared for each employee from the accumulated job tickets. Deduction cards have been previously punched for each employee for savings bond deductions, taxes and insurance. These deduction cards are then collated with the gross earnings cards and payroll slips are prepared. The payroll register is then run, and checked against the payslips, which are totalled by adding machine. The pay slips are then delivered to the bank, where the actual cash payroll is prepared for a cost of 5¢ per pay envelope. The payroll is inventoried when received from the bank for purposes of verification. The payroll is paid in cash primarily for the convenience of the employees. The supervisory and executive payroll (known as the "exempt" payroll) is handled separately in the Comptroller's office. This payroll is paid by check. The distribution of costs is given to the payroll section for inclusion in their monthly voucher summary.

For indirect and clerical labor, job tickets are gang-punched and time verified from employees' time cards.

All such employees are paid on a straight hourly basis.

The General Accounting Section is furnished monthly breakdown of payroll data by direct labor, indirect labor, clerical, supervisory, and executive for posting to the general ledger. The Payroll Journal is kept by the payroll section and contains detailed payroll data by month, broken down by departments for purposes of insurance and tax computations and other miscellaneous reports concerning labor.

Another important record maintained by this section is known as the "Open Labor Contract File Card". This record is kept on IBM machines. The card is punched whenever a contract is opened, and direct labor costs charged to each contract are obtained from the job ticket cards and punched to this record. Direct labor costs applicable to each job are thus accumulated until the contract is closed, at which time the Open Labor Contract card is removed from the file. From this card the Cost Accounting Section is furnished with total direct labor, standard costs, and actual costs - both total and unit - and variance.

By virtue of the IBM installation in this section, it is called upon to provide miscellaneous reports and data to other Departments. Some of the reports presently provided are:

1. Daily Sales Journal for the General Accounting Section. This data is collected from daily invoices.
2. Cost of Sales - furnished to the General Accounting Section. This data is from invoices collated with cost prices.
3. Sales Analysis for the Sales Department on a routine monthly basis - by territories, salesmen, product, etc.
4. Personnel analysis reports for the Industrial Relations Department as requested.
5. Engineering Project Reports - weekly.
6. Price Catalogs - irregular intervals.
7. Materials Cost Lists.

Comments:

The work of the Section is well organized and efficiently conducted. The IBM tabulating installation has been operating for a sufficient length of time to achieve smooth, routine operation. The only comment that might be made to further consolidate the administration of the payroll would be to transfer the "Exempt" payroll from the Office of

the Comptroller to the Payroll Section's IBM installation. This might be more economical, but is probably a matter of Division policy and no recommendation is accordingly submitted.

6.5 Cost Accounting and Price Control Section. The Cost Accounting and Price Control Section comprises a separate unit of the Accounting Department with the head of the section reporting directly to the Comptroller. The major functions of the section are:

1. Maintaining inventory adjustments occasioned by labor variances and material variances on connector products only.
2. Inventory valuation and material pricing. (Over 10% change in price subjects the material to review for new averaging.)
3. Pricing of Scrap materials and labor for charging to burden.
4. Maintains control (from a cost standpoint) over engineering changes. (Evaluates changes from viewpoint of cost to determine if economically feasible.)
5. Maintains standard and actual cost record cards on labor and materials for parts and assemblies.
6. Analyzes direct labor costs and initiates action to control such costs where appropriate. Material variance (on connectors only) posted directly to job order and investigated by Cost Section.
7. Supervises Physical Inventory (annually).
8. Supervises computing and establishing of selling costs and selling prices.

The Cost Accounting Section considers its primary function to be maintaining the in-process inventory at its maximum level of adjustment. This is accomplished by monthly adjustment of cost of sales and inventory accounts for variances in direct labor and direct materials for connector products only. Standard material costs are used for connector materials only. All other raw material inventories are carried at average cost and materials are charged at average cost to each job, thus incurring no material variance.

6.51 Inventories. Upon receipt of raw materials and parts for inventory, they are checked at receiving inspection

for verification of quantity and adherence to specifications. Invoices are then forwarded to Accounts Receivable for payment and a copy of the invoice goes to Cost Accounting Section where they are priced for material issuance by average cost method. The Material Control Section of the Production Department maintains maximum and minimum inventory levels, both of raw materials and purchased parts. Replenishment action is initiated by this section by requisition to the Purchasing Department where procurement is effected with due regard to economic lot sizes and market conditions. No inventory of raw material or of finished products is maintained as such. All work is considered "in-process inventory" until such time as sold. Control over "in-process inventory" is maintained at the top management level. Sales are correlated with "in-process inventory" to keep the inventory within realistic economic limits.

6.52 Placing Work In-Process. The job order, which is the form authorizing commencement of work on a particular job, originates in the Production Planning Section of the Manufacturing Department. It first goes to the appropriate storeroom for material issuance where it is held until released by the foreman of the Production Department when material is issued. A copy of the job order then goes to the Payroll Section, where an "Open Labor Contract File Card" is punched and which serves as authority to charge "job tickets" for direct labor against the job. Upon completion of manufacture, the product or part is finally inspected and goes to the Production Clerk in the storeroom where the count is verified. This information is punched on IBM cards and maintained by the Production Department.

6.53 Scrap. During the process of manufacture and inspection, defective parts are siphoned off and charged to scrap with appropriate credits to the job in-process and inventory for materials and labor concerned. Scrap tickets are originated when parts are rejected upon inspection. Defective parts with scrap tickets are sent to the salvage room. Scrap tickets are recorded on the job order by the Production Clerk and are punched on IBM cards. These cards then go to Cost Accounting for pricing of material and direct labor. Payroll section then credits the job and inventory and charges the scrap account. Scrap is burden. If the work can be salvaged, the entries are reversed with the additional labor involved charged to burden.

6.54 Labor Standards. From the job order form, (which also serves as a bill of materials) direct labor standard costs are determined from Cost Section records for a particular quantity of parts or products and are punched on IBM cards. If the lot is other than a standard size one, estimated costs are provided by the Cost Estimating Section. Standard labor costs are charged only in relation to the quantity of the lot in question.

6.55 Cost Control. Payroll Section furnishes the Cost Section with a weekly detailed tabulating run of direct labor costs on each job by Department. These costs are broken down into:

1. Straight Time.
2. Set-up cost.
3. Tool Trouble Allowance.
4. Incentive wages.
5. Scrap.
6. Standard Direct Labor Costs.
7. Variances.

The Cost Section then initiates action as required to ascertain reasons for variances.

Comments: The Cost Section utilizes a combined job costing and standard costing system. This involves considerable additional clerical work but is considered necessary so that actual costs are known on each contract or job.

While most direct labor operations have been time-studied and standards established, no standards have been developed for indirect labor. Indirect labor is generally so classified due to the difficulty in accurately relating its cost to specific productive operations that necessitate it. However, if costs are to be controlled, standards must be established against which actual performance can be measured, both for indirect labor as well as direct labor. Indirect labor standards can be established by determining by means of time study, work sampling, inspection records, production records, material consumption records or other available data just how much of a particular category of indirect labor is required for a particular productive operation. Since this labor is usually not on incentive wages, the time should be that required when working at a day-rate pace.

In view of the magnitude of inspection costs at Scintilla, it is possible that the development of standards in this area might be most helpful in cost control. It is also possible that the bench and centralized inspection could be directly related to specific operations and products, and thus classified as direct labor. While incentive pay is not advocated for this type of work for obvious reasons, standards are, for they will contrast what costs should be with what they actually are.

It is also considered that a breakdown of the monthly straight time for direct labor would be of much significance in pin-pointing areas of possible cost reduction. While each significant variance is individually investigated, the monthly straight time figure due to non-time studied operations, waiting for materials or reasons other than for which allowances are made, would be of considerable significance.

Variances, where of significance, are analyzed individually for a specific operation. This is the big advantage of the accumulation of actual job costs combined with standard costs. The weekly review of variances on individual contracts, while too late to remedy the causes on the specific operations for which they were computed, should nevertheless point the way for future avoidance of similar causes.

The magnitude of scrap generated during the productive process is cause for concern at Scintilla. No remedy is readily apparent for this condition except for a general tightening in manufacturing supervision and a searching review of such standards as may be applicable to the scrap generative processes along with a thorough check of each significant deviation from standard.

Recommendations:

It is recommended that:

1. The establishment of standards for indirect labor be thoroughly studied and that such standards be instituted as soon as possible as a means of tightening control over indirect costs.
2. Where inspection costs can be directly related to specific productive operations and products, they be reclassified as direct labor and standards developed. It is not advocated that inspection be placed on incentive.

3. Every effort should be made to reduce the straight time component in direct labor costs. To accomplish this, a further detailed breakdown of the specific causes of the straight time would be helpful in pin-pointing areas to be concentrated on.
4. Scrap and defective material historical experience data be reviewed with the objective of developing and applying standards where they do not now exist. All deviations from standard should be rigorously investigated.

6.56 Price Control. Price control is a subordinate unit of the cost accounting section of the Accounting Department. Its function is to co-ordinate the compilation of cost data for both new and existing products so that the sales department can be provided with a firm selling price to quote to prospective customers.

The procedure in effect for developing selling prices is as follows:

New Products and Inactive Items. (Price on Application). Price requests on these items usually originate with Customer Engineering or with Scintilla Field Engineering upon the customer's inquiry. Requests then go to the Sales Department, who originates a Price Estimate Request form. This form then goes to the Price Control Section, where it is logged and signed and forwarded to Engineering. Engineering develops prints and bills of Material as necessary and forwards the Estimate Request with attached data to the Factory Manager for review and approval. The form then goes to the Cost Estimating Section (with supporting data) for development of material, tooling and labor cost. Prints and bills of material are retained there. It then goes to the Production Manager for delivery information. The request is then returned to the Price Control Section, where factors for burden rate, tool amortization rate (if any), general and administrative expenses and mark-up are applied to arrive at a firm selling price. The Price Estimate Request form is retained by Price Control, who forwards the necessary data by internal correspondence to the General Manager for approval and to Sales for quotation to the customer.

Active Existing Products. On this type of product, customer price inquiries are referred directly to the Price Control Section, where a "Request for Price" form is prepared. Data for this form is computed from actual cost experience. Burden

FLOW OF PRICE ENQUIRY ON NEW PRODUCTS OR ALTERATIVES

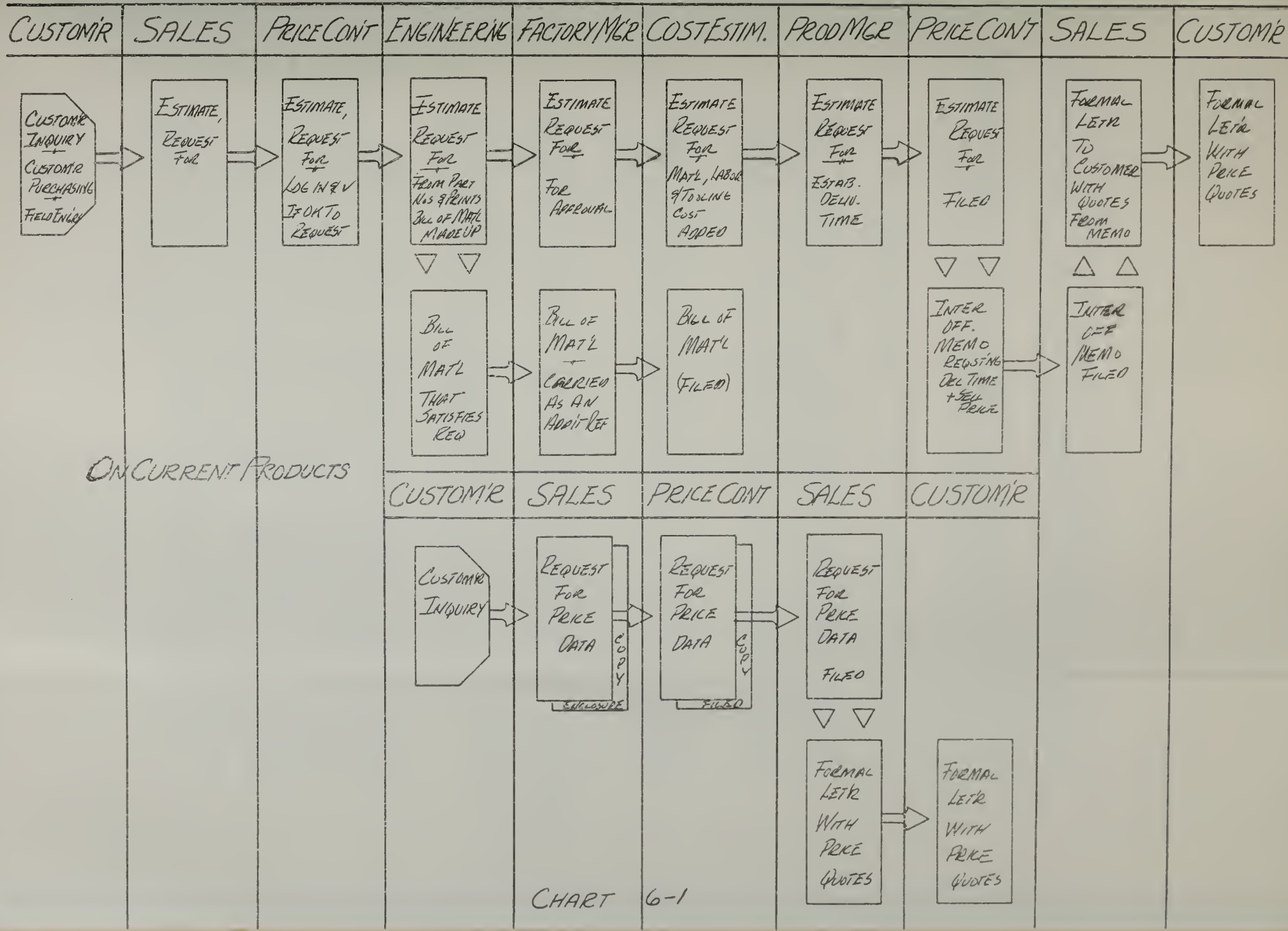



CHART 6-1

and other factors are applied as above to arrive at a firm selling price. The "Request for Price" is then forwarded to Sales for quote to the customer.

Catalog Items. Prices are quoted to the field from catalogs which are revised as necessary. Such items are primarily spare parts on which prices are developed as for active existing products above.

In addition to developing the price data above, the Price Control Section also:

1. Approves all customer requests for accelerated delivery and re-scheduling from the standpoint of their possible effect on costs and selling price.
2. Approves all engineering changes from a cost standpoint, weighing the effect of such changes on a given selling price.

6.6 Credit Section. The Credit Section comprises a separate unit of the Accounting Department, with the head of the section reporting directly to the Comptroller. The functions of this Section are:

1. It is responsible for the establishment and follow-up on all credit ratings of customers, dealers, and sub-contractors.
2. Reviews customers' debit memoranda and determines proper action.
3. Obtains information as required through credit rating agencies and/or personal investigations.
4. Initiates action as necessary on past-due accounts.
5. Maintains close liaison with the Sales Department.

The procedure followed by the Credit Section necessarily differs between new and old customers. In the case of new customers, the purchase order is received from the Price Control Section. The credit rating of the prospective customer is then checked in Dunn and Bradstreet. If the rating merits it, an open account is approved. If the rating merits caution, a C.O.D. arrangement may be suggested. In this instance, the purchase order then goes back to Sales, where action is taken to notify the prospective customer that the order is acknowledged and on what terms. If the customer is not satisfied with C.O.D. terms, he may submit additional references, which are forwarded to Credit for review and investigation upon receipt.

# INTERACTION BETWEEN CREDIT, BILLING, & SALES

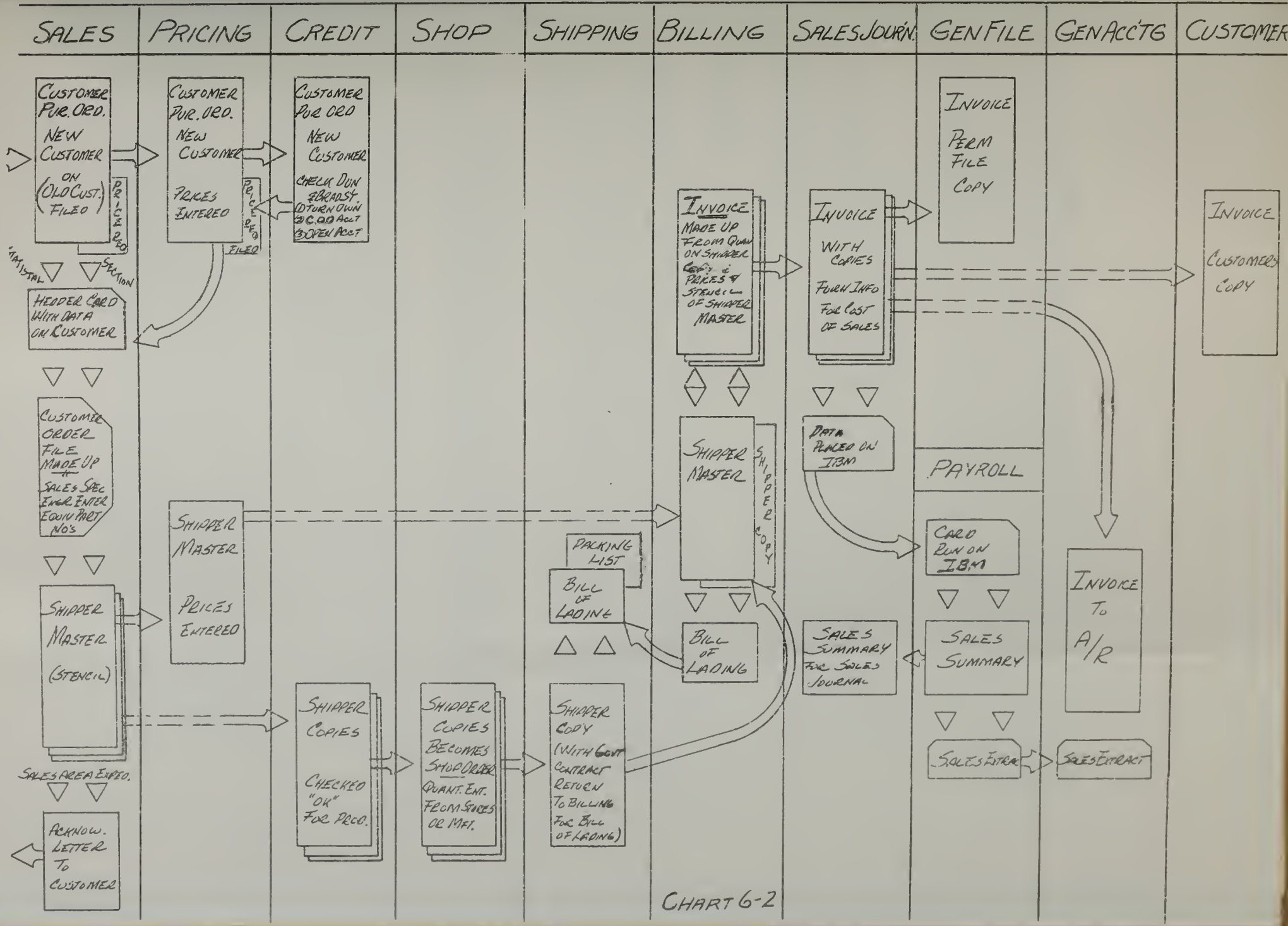

SALES
PRICING
CREDIT
SHOP
SHIPPING
BILLING
SALES JOURN.
GEN FILE
GEN ACC'TG
CUSTOMER
CUSTOMER PUR. ORD. NEW CUSTOMER (OLD CUST. FILED)
PRICED
STATISTAL
SECTION
HEADER CARD WITH DATA ON CUSTOMER
CUSTOMER ORDER FILE MADE UP + SALES SPEC ENGR ENTER EQUIV PART NO'S
SHIPPER MASTER (STENCIL)
SALES AREA EXPED.
ACKNOW. LETTER TO CUSTOMER
CUSTOMER PUR. ORD. NEW CUSTOMER PRICES ENTERED
PRICED
FILED
SHIPPER MASTER PRICES ENTERED
SHIPPER COPIES CHECKED "OK" FOR PROD.
CUSTOMER PUR ORD NEW CUSTOMER CHECK DUN & BRADST. ① TURN DOWN ② C.O.D. ACCT ③ OPEN ACCT
SHIPPER COPIES BECOMES SHOP ORDER QUANT. ENT. FROM SALES OR MFI.
PACKING LIST
BILL OF LADING
SHIPPER COPY (WITH GOVT CONTRACT RETURN TO BILLING FOR BILL OF LADING)
INVOICE MADE UP FROM QUAN ON SHIPPER COPY & PRICES & STENCIL OF SHIPPER MASTER
SHIPPER MASTER
SHIPPER COPY
BILL OF LADING
INVOICE WITH COPIES FOR INFO FOR COST OF SALES
DATA PLACED ON IBM
SALES SUMMARY FOR SALES JOURNAL
INVOICE PERM FILE COPY
PAYROLL
CARD RUN ON IBM
SALES SUMMARY
SALES EXTRA
INVOICE CUSTOMERS COPY
INVOICE TO A/R
SALES EXTRACT

CHART 6-2

When the customer's credit has been satisfactorily established, the Sales Department has its statistical section (IBM) prepare the Shipper Master of the invoice. (Note: This section has already made up a "Header Card" on original receipt of the purchase order before passing it on to Pricing.) The Shipper Master is now sent to the Billing Section, while a copy goes to Credit for approval prior to the order being released for production.

On old established customers, the Master Shipper is made up immediately along with the Header Card for the new items, and as before, the Scintilla part numbers are entered for cross reference purposes. The Shipper Master is then sent to Pricing for price entry, and then to the Credit Section for a routine approval before going to the Billing Section.

Comments:

The work of this Section is well organized and efficiently conducted. In view of the predominance of government sales in the Division's business, the function of Credit is not as important as it would otherwise be. The almost non-existent bad-debt experience of the Division is certainly an excellent testimonial to the effectiveness of the Division's credit policies and procedures. No recommendations are offered.

6.7 Billing Section. The Billing Section comprises a separate unit of the Accounting Department with the head of the unit reporting directly to the Comptroller. The functions of this unit are:

1. Responsible for the computations, checking and control of all billing of customers.
2. Initiate correspondence with customers concerning the correctness of invoices.
3. Co-ordinates closely with General Accounting, Credit, Price Control, Sales and Service.
4. Maintain records of purchase orders, invoices and shippers.

The Billing Section receives the Shipping Master stencil from the Pricing Section. It is filed in Billing pending receipt of the copy of the "Shipper" sent via the shop. On receipt of the shop copy of the "Shipper" from the Shipping Department following completion of any increment of the total order, the Master Shipper stencil with

prices entered by Pricing, is pulled and completed with quantities taken from the Shop copy. (Note: The shop actually receives numerous copies of the shipper and processes these copies as the increments of the order are completed, noting on the last "Shipper" -- "Order Complete".) This becomes the sales invoice, which together with the required copies is forwarded to the Sales Journal Section. On Government orders, the shop copy of the "Shipper" is routed from Shipping to Billing for Bill of Lading and back to Shipping. Here the shipping entries are made and the "Shipper" along with a copy of the Bill of Lading is returned to Billing Section for normal processing.

Comments:

A pilot run is now being made on a new IBM system for handling purchase orders, shippers, and invoices for the connector business only. If successful in reducing processing time and costs, this system will be expanded to include all other products. At the moment, however, there is much overlapping of the old and new procedures and as yet there have been no savings in cost and but little saving in processing time.

In this system the purchase order is still processed in the Sales Department but with the new IBM equipment the Shipper as well as a more complete IBM Customer card file (in duplicate) is made up at the same time, thus eliminating the old Customer Order file. The Customer cards are filed in tub files (one for Sales Department and one for Billing). Shipper master and Shipper copies are routed as before to arrive in the Billing Section with the information required for making up invoices. At this point the duplicate Customer's tub file should come into play through the use of the 407 IBM to process and extend the accumulated data for Accounts Receivable, Cost of Sales, as well as for the invoices. In this arrangement the Cost of Sales section would be eliminated but as yet this is not the case.

At this point it might be well to point out that with the incorporation of the 407 it would seem appropriate to also consider combining the Accounts Receivable, Sales Journal and Billing section and thus make a clean sweep of duplication. This would expedite handling of all data and should be a decided saving in cost.

# NEW AND PROPOSED ACCOUNTING PROCEEDURE FOR CONNECTOR BUSINESS

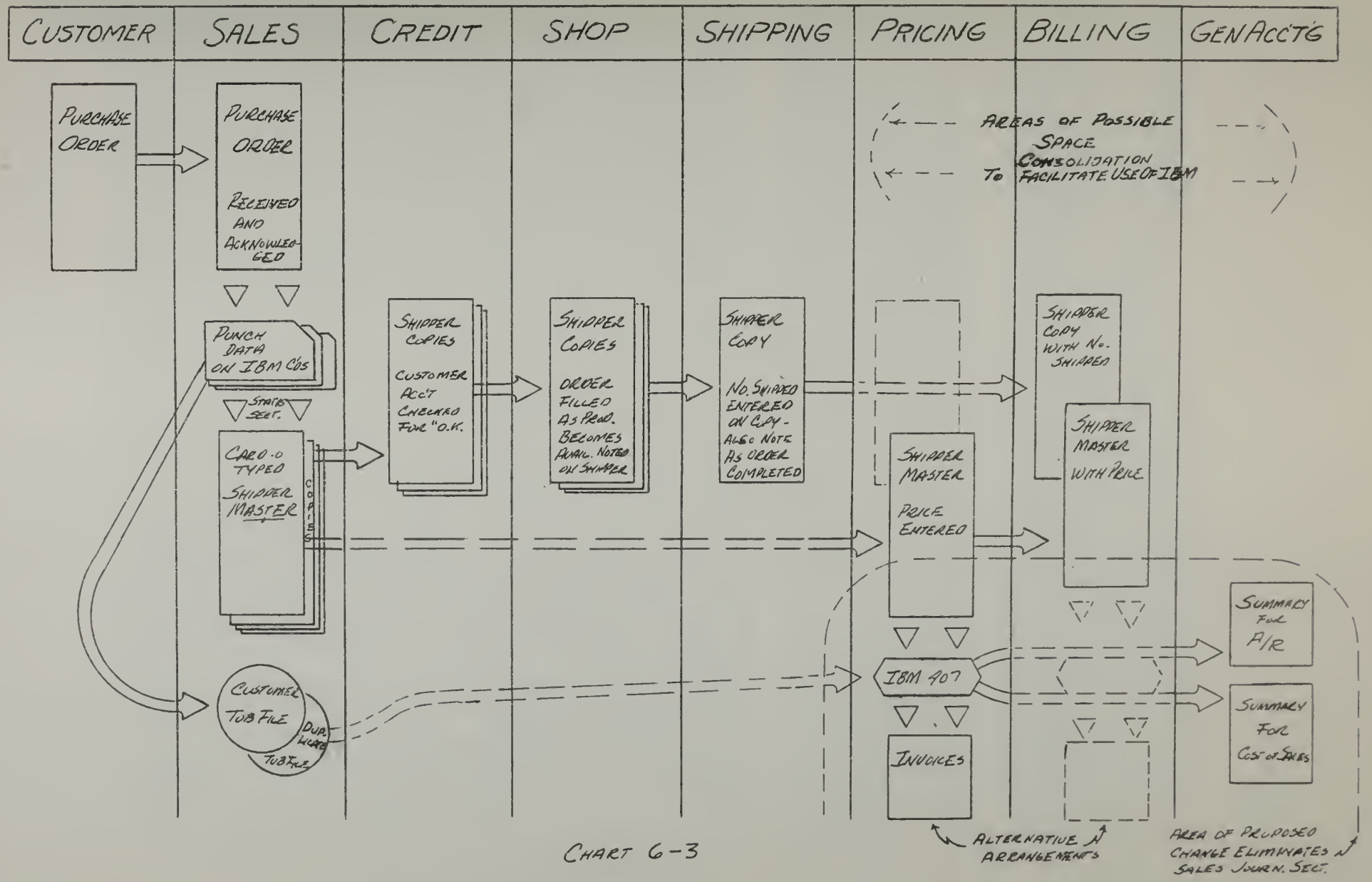



CHART 6-3

Recommendations:

It is recommended that:

1. The changeover in the Billing Section to machine Accounting techniques be extended to cover all billing operations, and the the system be expanded to include the Sales Journal and Accounts Receivable Sections in due course.

6.8 Contract Termination. The Contract Termination Section comprises a separate unit of the Accounting Department with the head of the unit reporting directly to the Divisional Comptroller. The function of the Unit is to promptly terminate all work under a contract upon receipt of a termination notice, and to accumulate all costs up to the point of termination for billing the customer or filing claim. The procedures generally followed are those specified by the Armed Forces concerned.

Notification of a cancellation is normally received from the customer by the Sales Department who immediately refers to the purchase order to check on the status of orders and deliveries. Sales notifies Production Scheduling on a "preliminary cancellation notification" form. Production Scheduling determines whether work has actually started on the order, and if so, requests that contract termination issue a termination code. If a code is assigned, Sales issues a contract termination notice, giving details of quantity cancelled. This form is duplicated for adequate distribution throughout the plant. Copies go to Production Planning (for quantities in production or under sub-contract), Purchasing (to notify sub-contractors of termination by wire), Engineering (if the contract is an experimental one), Storeroom (expeditors accumulate parts and place in "Hold Status" in storeroom crib), and Contract Termination for accumulation of all pertinent data. The storeroom clerk advises Production Planning of the material in the crib lodged against the termination code. Production Planning then issues a segregation list, after determining whether any of the parts can be used in other orders. The storeroom then tags the parts with an inventory ticket, with copy going to the Termination Section. Only good parts and reworkable rejects can be assigned a termination code. The inventory ticket is then sent to Cost Accounting for pricing, from whence it is returned to Termination Section for preparation of termination claim. Price Control Section also consulted whether the cancellation will result in an increase in price for pieces remaining on the

order due to decreased quantity or charging of tooling costs (if any). The claim is filed directly with the Prime Contractor, who audits and pays Scintilla directly. The material is disposed of in accordance with the Prime Contractor's instructions, or the Navy's instructions in the case of Navy Contracts.

Journal entries as follows are made when the claim is filed:

Dr.---Unbilled Cancellation Claim (52)

Cr.---Inventory (75)

Upon approval of claim, the customer is billed and Accounts Receivable are charged with a credit to Unbilled Cancellation Claim (52). Such billing is also applied to the Sales and Cost-of-Goods-Sold accounts.

Comments:

The objective of this Section is to stop all work on an order immediately upon receipt of a termination or cancellation notice. Every effort is made to use parts already completed or in-process on other orders, and thus make the cost of the termination as reasonable as possible to the customer. Procedures followed are in most instances those required by the regulations of the Armed Forces. It is considered that this Section accomplishes its objective in a most effective manner. No recommendations are offered.

## 6.9 Summary of Recommendations.

### 6.91 Organization. It is recommended that:

1. A current Departmental Organization Chart be developed.
2. Job Descriptions be prepared and provided for all positions down through the section head level. If such descriptions are presently in existence, they are not apparently in the possession of the Staff Assistants or the Section Heads.
3. Sufficient space be allocated in the Division's expansion plans to permit physical consolidation of the Department at the central offices. Improved communications and more economical use of equipment should result therefrom.

4. The Billing and Sales Journal Sections be combined with the Accounts Receivable unit of the General Accounting Section. Similarity of functions should facilitate such a merger with attendant personnel and equipment economies.
5. That for long-range planning purposes (i.e., within a five-year period) the Department be organized into two major sections -- a Cost Accounting Section and a General Accounting Section, with each section headed by an Assistant Comptroller. A Staff Assistant to the Comptroller would also be provided for computation of burden rates, budgets, study of machine accounting techniques and other duties as considered necessary by the Comptroller. Such an organization would reduce the present span of control of the Comptroller, provide a clear-cut organization and better defined chain of authority within the Department.

6.92 Budgets. It is recommended that:

1. "Fixed percentage" yardsticks be avoided in the development of departmental budgets, and that past historical costs be viewed only as a reference in developing budgets based on good potential performance and achievement of future goals.

6.93 Sales Journal. It is recommended that:

1. The functions of this section be adapted to machine accounting techniques and integrated into a combined Billing, Sales Journal and Accounts Receivable System.

6.94 General Accounting. It is recommended that:

1. Machine Accounting techniques (such as IBM) be adopted in the General Accounting Section, particularly in the Accounts Receivable and Accounts Payable Areas. It is considered that greater efficiency and savings in clerical labor would result.
2. If Corporate policy will permit, it is recommended that:
   A) Reserve for Bad Debts charges be reduced to more closely reflect actual bad debt experience.
   B) Depreciation policy be changed from present straight line method to a method more representative of actual decrease in asset value, such as the Sum of the Years' Digits.

3. If repair cost histories for individual pieces of equipment are not now retained and compiled elsewhere, that such records be kept by the General Accounting Section as an aid in determining when equipment has reached the end of its economic usefulness and should be replaced.

6.95 Cost Accounting. It is recommended that:

1. The establishment of standards for indirect labor be thoroughly studied and that such standards be instituted as soon as possible as a means of tightening control over indirect costs.
2. Where inspection costs can be directly related to specific productive operations and products, they be reclassified as direct labor and standards developed. It is not advocated that inspection be placed on incentive.
3. Every effort should be made to reduce the straight time component in direct labor costs. To accomplish this, a further detailed breakdown of the specific causes of the straight time would be helpful in pin-pointing areas to be concentrated on.
4. Scrap and defective material historical experience data be reviewed with the objective of developing and applying standards where they do not now exist. All deviations from standard should be rigorously investigated.

6.96 Billing. It is recommended that:

1. The changeover in the Billing Section to machine accounting techniques be extended to cover all billing operations, and that the system be expanded to include the Sales Journal and Accounts Receivable Sections in due course.

# CHAPTER VII - TRAFFIC

7.1 General Discussion. The Traffic Department is organizationally comprised of the Transportation, Receiving and Shipping Departments and has a personnel count of approximately 150 people. The Traffic Manager is the Department Head and is responsible directly to the General Manager for administering these departments. Recommended organizational changes are discussed in Chapters I and XI.

## 7.2 Traffic Office

7.21 Travel Reservations. This office receives all travel requests. During the year ending August 1, 1956, this office processed 413 original airline departure reservations and approximately 300 original railway departure reservations. In addition, this office arranges for hotel reservations, purchasing of tickets, confirmation of wires and similar matter. During this same period arrangements were made whereby the Scintilla airplanes accommodated 824 passengers.

7.22 Petty Cash Fund. This office administers the Petty Cash Fund for the entire plant. The purpose of this fund is to permit the ready purchase of required material in an amount not to exceed $25.00. Upon receipt of a requisition which has been approved by an authorized person, the Purchasing Department issues a Petty Cash Order to the Traffic Office, which then effects the purchase and delivers the material to the party originally submitting the requisition.

7.23 Household Effects. This office is responsible for the action required to effect the moving of employee household effects, when the moving of same has been approved through channels.

7.3 Transportation (General). The Transportation Department is primarily responsible for all external traffic operations wherein utilization of Scintilla vehicles and aircraft is required. A Transportation Supervisor coordinates this department which has a foreman in charge of

the Vehicle Section and a senior pilot in charge of the Aircraft Section. These section heads are directly responsible to the Traffic Manager. The department has a personnel count of approximately 12 people and a vehicular and aircraft count of approximately 19 and 2 respectively. (Approximations are used since the counts vary over the year.)

7.31 Vehicular Transportation. The Scintilla-owned vehicles are used primarily for short-run passenger hauling, interplant mail runs, effecting petty cash purchases of material, picking up raw material, delivering shipping and supplying sub-contractors. While the total travel of the vehicles is approximately 35,000 miles per month, there has not been a reportable accident in over four years. Reportable accidents are classed as being in excess of $50.00. This is an excellent safety record and is considered attributable to the long experience of the drivers with the company and the excellence of maintenance performed on the vehicles. Only routine maintenance is performed by Scintilla mechanics. A separate notebook is kept for each vehicle in which is recorded all maintenance performed, oil consumption, gasoline consumption, and similar items. Monthly mileage, gasoline and tonnage reports are compiled for the vehicles, as well as the Daily Trip Report.

7.32 Aircraft Transportation. Due to the specialized skills required in aircraft maintenance and operations, the Senior Pilot makes decisions as to satisfactoriness of weather, plane capabilities and similar items, while the Traffic Office schedules the flights. Department Heads of major departments authorize the travel of their personnel by Scintilla aircraft. Scintilla mechanics perform aircraft maintenance up to but not including engine overhauls; they do make engine changes. The following reports are compiled: a weekly report of plane usage, a monthly report of hours logged by different passengers, a monthly report of hours logged by each plane and each pilot, and a quarterly report of aviation gasoline consumption and inventory.

7.33 Transportation Charges, Material Routing, and Tracing of Shipments. The Transportation Department is also responsible for the auditing, verification and approval of all transportation charges, including claims for carrier damage to material, prior to their being processed for payment by the Accounting Department. In addition, it routes

all incoming material by noting the routing to be used on two copies of the purchase order prior to its being released to the vendor. It also traces missing or delayed shipments, usually at the request of the Purchasing Department.

7.4 Receiving (General). The Receiving Department is responsible for the receipt of all incoming shipments of parts, units and materials and their delivery to inspection as required. A foreman is in charge of this department and is directly responsible to the Traffic Manager. The department has a personnel count of approximately 17 people. Shipments of parts, units and materials arrive by common carriers, Scintilla trucks and other companies' trucks at the Scintilla receiving dock. Upon arrival of a shipment its contents are checked, then a checker compares the waybill with a copy of the purchase order to insure that the items, quantities and scheduled date of arrival of the shipment are in conformance therewith.

7.41 Shipments Acceptable to Receiving. If a shipment is received and found to be correct, this information is so recorded on the Receiving Department's copy of the Purchase Order (PO), which is then refiled. A Receiving Form (RF) is then prepared in quintuplicate with copies distributed as follows: Nos. 1 and 2 to Inspection; No. 3 to Accounting as advance notice of receipt of the shipment; No. 4 to Purchasing; and No. 5 retained for file. The packing list received with the shipment is also filed with the RF. Should the shipment later be rejected for quality by Inspection, then Inspection prepares a Receiving Inspection Report (RIR), one copy of which is received by the Receiving Department so its copy of the PO can be corrected.

7.42 Damaged Shipments and Shipments with Shortages or Overages.

If a damaged shipment is received, or if a shortage or overage of count or weight is found, the Receiving Department notes this information on the RF, prepares an RIR in penciled draft and attaches it to copies numbered 1 and 2 of the RF and forwards them to Inspection. Should a portion and/or all of a damaged shipment, or one with a shortage or overage, be accepted for quality by Inspection, when an RIR penciled draft is attached, then Inspection prepares the RIR in smooth draft (5 copies), one copy of which is returned to the Receiving Department so its copy of the PO can be corrected.

7.43 Unacceptable Shipments. In the event of duplicate shipments, shipments arriving in advance of prescribed schedules, and overages in shipments, which Scintilla is not agreeable to keeping, the Receiving Department prepares an RIR in penciled draft and forwards same to Inspection. Inspection prepares the RIR in smooth draft, files the penciled draft, and returns the smooth RIR to the Receiving Department. The Receiving Department then forwards the RIR to the Shipping Department along with the shipment to be returned to the vendor. When the shipment has been made, the Receiving Department receives a copy of the RIR from the Shipping Department.

7.44 Certification to Specifications. When a PO requires that the items in a shipment be certified as to conformance with certain specifications, the Receiving Department is responsible for checking to insure that the certificate is attached. The certificate is sent to Inspection with the RF. In the event the certificate is missing, it is so noted on the RF.

7.45 Methods of Checking Shipments. In checking shipments for quantity, it is the usual practice to hand count large items such as castings, scale count small items such as screws, and weigh one bar and multiply its weight times the number of bars received for uniform bar stock. If a shipment of items is received from a vendor which has proven itself to be reliable in shipping correct quantities, especially of bar or sheet stock, it is the usual practice to spot check these items only; however, the waybill is always compared with the PO for weight verification. If a shipment of items is received from a vendor with which Scintilla has not done business in the past or with which reliability has not been proven, it is the usual practice to completely check the shipment for quantity.

There are no written instructions specifying the methods of checking shipments to be employed. The lack of written instructions permits the use of a multitude of different methods, some of which may not be in the best interests of the company. It is recommended that written instructions be prepared which outline in detail the methods of checking incoming shipments, which management desires to have in effect. Promulgation of these instructions will set the degree of checking incoming shipments which management considers to be satisfactory.

7.46 Carrier Charges. The Receiving Department prepares a sheet daily listing the collect carrier charges for which Scintilla is responsible to make payment.

7.5 Shipping (General). The Shipping Department is responsible for the packaging, preservation and shipping of all parts, units, materials and other miscellaneous items. The Shipping Department is also responsible for the furnishing of quotations on the cost of packing, when such information is requested. A Supervisor is in charge of this department and is directly responsible to the Traffic Manager. The department has a personnel count of approximately 119 people. There are primarily four different forms, any one of which when received by the Shipping Department, authorizes the shipment of the items sent with and listed on the completed form. They are commonly referred to as Shippers, Repair Orders, Receiving Inspection Reports, and Shipping Forms. During the Fiscal Year 1956 the Shipping Department processed the following:

| | |
|---|---|
| Shippers | 72,916 |
| Repair Orders | 1,668 |
| Shipping Forms | 6,351 |
| Receiving Inspection Reports | 3,962 |
| Total | 84,900 |
| Daily Average | 340 |

Shipments varied from one or two items up to over one hundred items per shipment. It is noted that a minimum of records are maintained in the Shipping Department, which is in accordance with recommended practices.

7.51 Shipments Authorized by Shippers. The Shippers are the most commonly received shipping authorization, since they are used for shipping everything that Scintilla produces for its customers. Upon receipt of a Shipper from Stock "S", with the quantity of items to be shipped marked thereon by Sales Allocation, the Shipper is immediately receipt date stamped. Thus it is always possible to determine exactly when items for shipment were received by the Shipping Department. The Shipper not only tells to whom and how the shipment is to be made, but it also specifies exactly how each item is to be preserved and packaged. A group leader distributes the work among the individual workers; the workers in turn actually do the preserving and packaging. The individual

worker fills out certain data on the Shipper, such as the box number and weight. The Shipping Office personnel then assign the Shipper a control number, enter shipping data in the control ledger, put on the routing, and prepare the address labels, bill of lading in quadruplicate and the packing list in triplicate. One copy of the packing list is attached to the shipment, one is placed in the Shipping Department's file and the remaining copy is sent to Traffic at such time as the Shipper and the original of the bill of lading, which has been signed by the carrier, are sent. The carrier also signs another copy of the bill of lading as well as the control ledger. This signed copy of the bill of lading is retained in the Shipping Department's file as proof of shipment, for a period of seven years. The remaining two copies of the bill of lading are given to the carrier, one copy of which must be surrendered to the gate guards as the authority for removing the shipment from the Scintilla grounds.

7.52 Shipments Authorized by Repair Orders. Repair Orders are serialized forms used as the authority for the shipment of Scintilla products that were returned to the Scintilla plant by various customers and that have now been repaired and are ready for return shipment. Repair Orders are received from the Sales Service Department and are processed in a manner similar to the Shippers, except that they are not assigned a control number nor are they entered in the Control Ledger, since they are serialized.

7.53 Shipments Authorized by Shipping Forms. Shipping Forms are serialized forms used as the authority for the shipping of material to subcontractors, returning of containers to vendors, sending out equipment for repairs, and other miscellaneous shipping. The requests to have items shipped are received by the Accounting Department from the various departments throughout the plant. The Accounting Department prepares the Shipping Forms and returns them to the requestors who in turn send the forms and the material to the Shipping Department for packing and shipping. Shipping Forms are processed in a manner similar to Repair Orders, except that the preparation of packing lists are not required, since the Shipping Forms themselves are used to serve this purpose. The original of the Shipping Form is sent to Accounting, one copy to the originator of the request for shipment, one copy to Purchasing, one copy with the shipment, and one copy retained for the Shipping Department's file.

7.54 Shipments Authorized by Receiving Inspection Reports.

Receiving Inspection Reports are serialized forms used as the authority for shipping items to vendors, because the items received from the vendors were found to be in one of the following categories: damaged, unsatisfactory quality, duplicate shipment, date of receipt prior to the specified acceptable date of arrival, and for other similar reasons. These forms are received from either the Inspection or Receiving Department. The Receiving Inspection Reports are processed in the same manner as the Shipping Forms. One copy is attached to the signed bill of lading, one is sent with the shipment, and the remaining copy is retained for the Shipping Department's file.

7.55 Shipping Report. The Shipping Office prepares a Daily Report of Products Shipped on a ditto master only. This report includes only those shipments authorized by a Shipper or a Repair Order. This report is then sent to Traffic with the Shippers and Repair Orders attached and also the copies of the bills of lading and packing lists. Traffic puts on the transportation charges, records the tonnage shipped, and forwards the report to Sales Billing for reproduction and distribution.

7.56 Packing Cost Estimates. Upon receipt of a request for a packing cost estimate from Price Control, the Shipping Department furnishes that cost which is over and above normal domestic packing costs. This is done since the cost of domestic packing is already figured into the price of the product.

7.57 Shipping Workload. The Shipping Department's workload is being handled separately in this report, since it is felt that this item along presents the major area for improvement in the efficiency of the Shipping Department, although it is not controllable by said Shipping Department. To illustrate the problem at hand, a comparison was made between the actual average daily shipping billing and the desired daily billing goal for the period from October 1956 through March 1957. This comparison reveals the extent to which the desired daily billing goal is being missed. Since the majority of the shipments remain in the Shipping Department for a period of less than 48 hours, the curve plotted in Figure 7-1 is highly indicative that the products to be shipped are not arriving at

a regular pace. The curve shows that only 25% of the total billing is being met during the first one-third of each month and 75% is being reached by the 27th of each month. Naturally this generates a need for a considerable amount of overtime work and the deploying of people from other departments to assist the Shipping Department in meeting this last of the month upswing in workload. In fact it is now the practice to borrow one or two days billing from the following month in order to meet the monthly billing goal set by management. When the desired billing and the actual billing become separated to the extent that they are in Figure 7-1, it is highly indicative that efficiency is suffering. Although this portion of the report is concerned primarily with the Shipping Department, it must be pointed out that the lack of effective scheduling and controlled production are the primary deterrents to more efficient operations within the Shipping Department. The effect on the Shipping Department's efficiency brought about by the low receipt of material for shipment during the first part of each month is illustrated in Figure 7-2. An efficient Shipping Department working at a normal pace would, on the average, meet its daily billing goal of 3-1/3%. During the period October 1956 through March 1957 the Shipping Department received only enough products during the first one third of each month that they averaged only slightly over 2-1/3% per day. This indicates that the workers are performing at approximately 70% efficiency during this portion of the month. From the 12th to the 27th of each month they accomplished 50% of the billing, indicating that they performed at normal or approximately 100% efficiency. The remaining 4 days, or more, are difficult to evaluate in terms of employee efficiency since the remaining 25% of the billing goal is accomplished by not only normal work, but also by the deployment of additional workers from other departments to assist the Shipping Department, by borrowing billing from the first or second day of the succeeding month, and by a more concerted effort to push through the more expensive products during this time. This entire practice does not lead to efficiency. It is estimated that an average of 100 employees working one third of a month at a pace 70% of normal at $2.00 per hour would result in an annual loss to the company of approximately $40,000. The efficiency figure of 70% may be somewhat exaggerated in view of the present practice of holding back low dollar volume work for performance during the first part of each month. Although dollar volume is not necessarily the best measure of Shipping's workload, it is certainly a strong indicator and serious consideration should be given to correcting the lack of effective scheduling and controlled production.

## 7.6 Summary of Recommendations.

1. It is recommended that written instructions be prepared which outline in detail the methods of checking incoming shipments.

2. It is recommended that action be taken to correct the apparent lack of effective scheduling and controlled production to ensure the uniformity of flow of material to the Shipping Department.

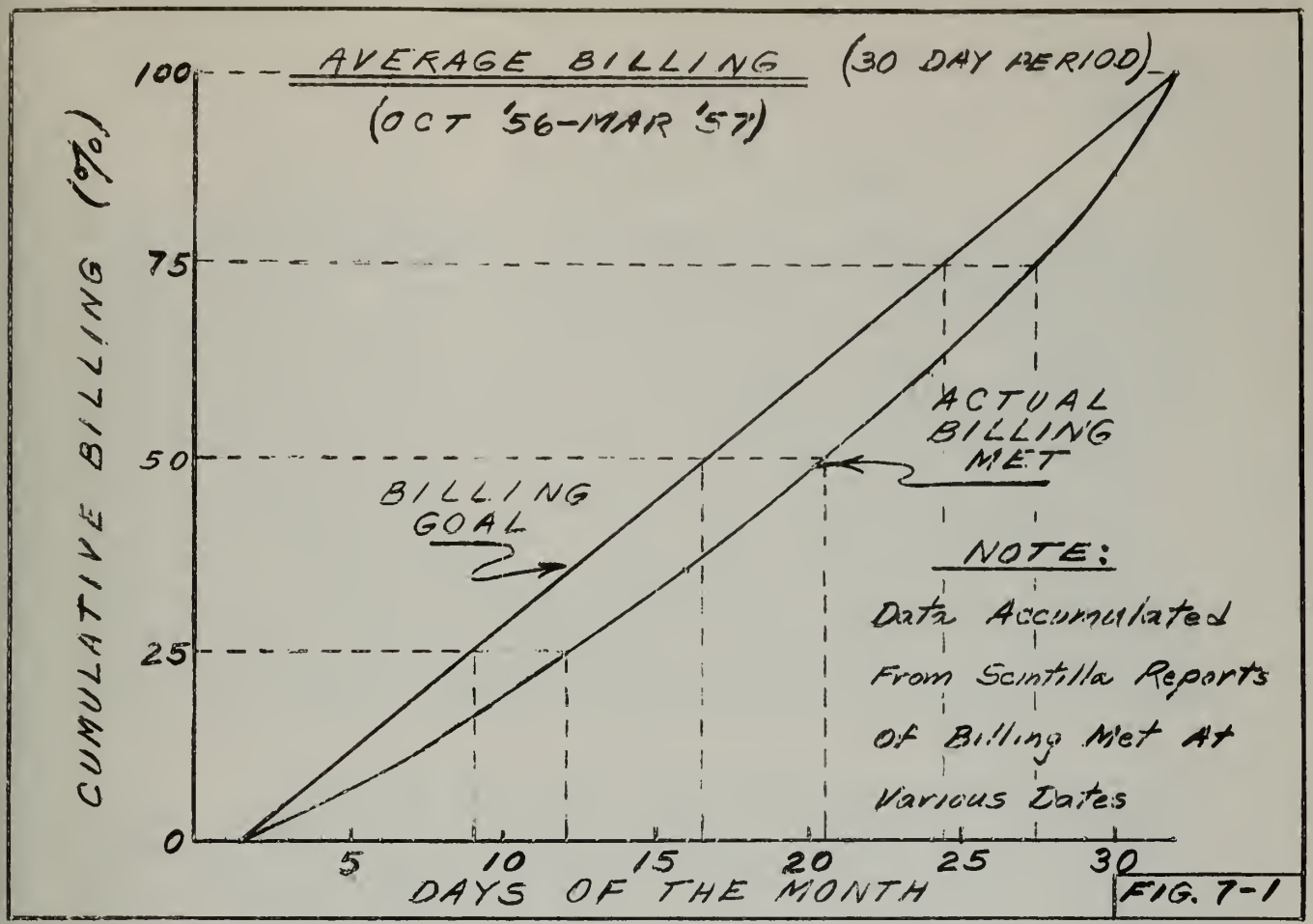

AVERAGE BILLING (30 DAY PERIOD)
(OCT '56-MAR '57)
CUMULATIVE BILLING (%)
100
75
50
25
0
BILLING GOAL
ACTUAL BILLING MET
NOTE:
Data Accumulated From Scintilla Reports Of Billing Met At Various Dates
5
10
15
20
25
30
DAYS OF THE MONTH

FIG. 7-1

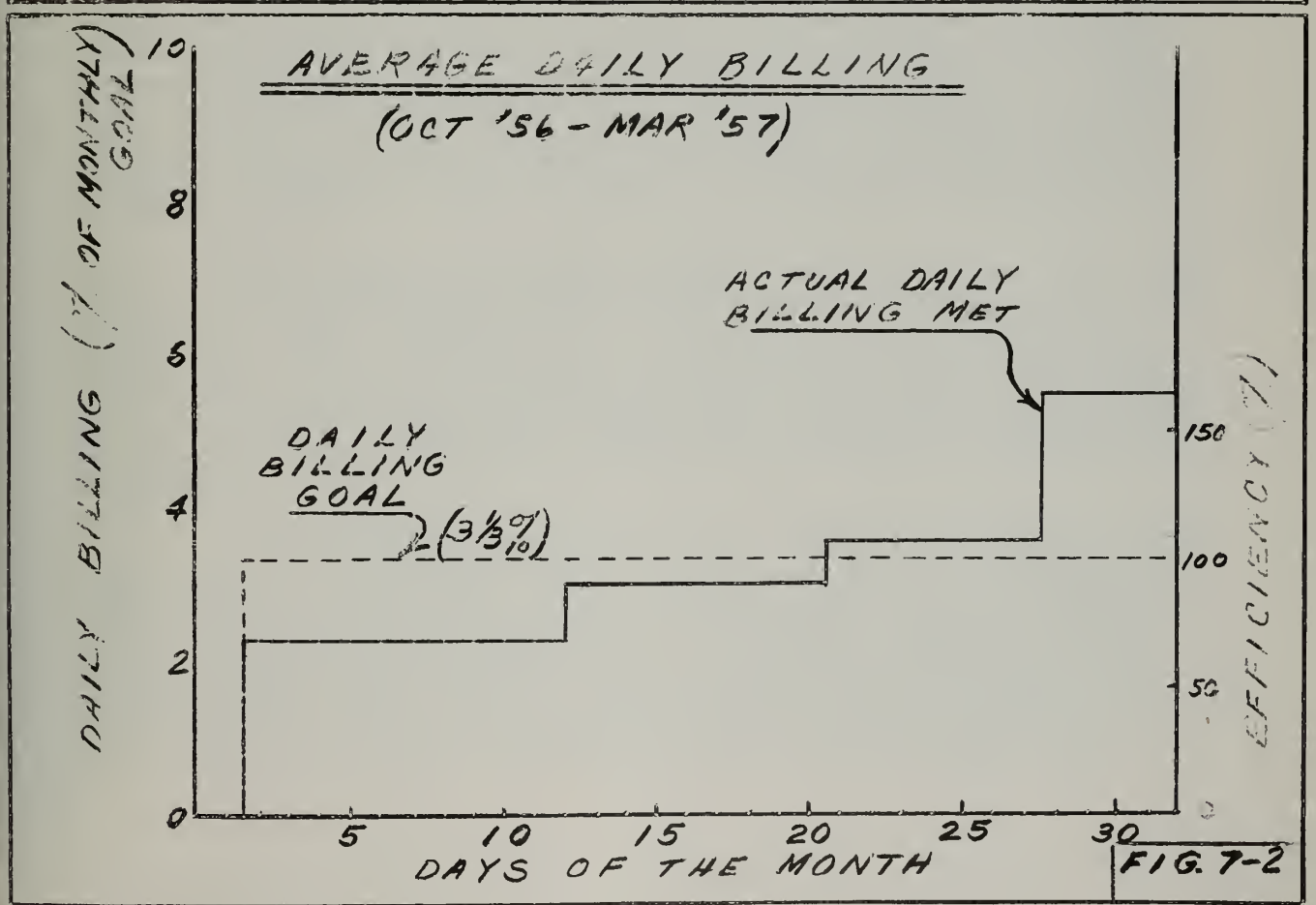

AVERAGE DAILY BILLING
(OCT '56 - MAR '57)
DAILY BILLING (% OF MONTHLY GOAL)
10
8
6
4
2
0
ACTUAL DAILY BILLING MET
DAILY BILLING GOAL
(3 1/3 %)
EFFICIENCY (%)
150
100
50
0
5
10
15
20
25
30
DAYS OF THE MONTH

FIG. 7-2

# CHAPTER VIII - ENGINEERING DEPARTMENT

8.1 General Discussion. Throughout the course of this study certain basic characteristics of the Engineering Department became evident. One such characteristic is the high engineering standards which are maintained in the various stages of blueprint production, recording and distribution. Another is the relatively high status of the design sections, hereafter referred to as the Design Group. Within the Design Group, practically complete delegation of authority is granted the project engineers in certain matters of design, procedures and job progressing. The effects of such a high degree of job responsibility will be more fully discussed later. Another basic characteristic is the effect that rapid recent expansion has had on the organizational structure. Finally, characteristic of the department is the apparent high calibre of the individuals in positions of authority. By virtue of this collection of technical and executive skills the strength of the department can, to a great extent, be traced.

Hence, Engineering, which employs approximately ten percent of Scintilla Division personnel, appears to occupy a strong position in Divisional matters. This, and other factors, help to enforce the Scintilla claim that they are a creative engineering enterprise. Evidences of this are the well-established laboratories and, in particular, the Experimental Manufacturing Shop, whose primary function is to produce experimental and prototype models from Scintilla designs. The inclusion of the Experimental Manufacturing Shop in the count of Engineering personnel justifies the rather high percentage of Engineering personnel to the total Scintilla employment figure.

The Engineering Department seems well aware of, and firmly in control of its major functions of designing and setting quality standards for all products manufactured at Scintilla. However, there is a duality of standards arising in the interaction of the Engineering and Service Departments relative to the servicing of parts and assemblies, which will be discussed in Section 8.7 and which is also discussed in Chapter IX.

The Scintilla Division has evidently recognized the importance of systematic and careful review of the needs for new products or proposals for new products by the provision for the New Products Committee. It appears, however, that this committee has not met for over a year. Consequently, it seems that there has been no committee type guidance in this important area during this period. The "Engineering

Project Request" system seems to be the only means of formalizing new products or design ideas, and bringing them to the attention of cognizant Division officials. Even the EPR appears to be falling into disuse because the requirements of major customers are automatically undertaken by Engineering. Neither additional work nor work of a selective nature seems to be desired. This appears to leave a definite vacuum in the top-level long-range policy and planning regarding product development, and is a factor working at odds with the "creative engineering" concept previously mentioned.

Bendix Corporation places a minimum of restrictions on the engineering activities of the Division. On the other hand, little Bendix guidance is evident and it may be that closer co-ordination might prove fruitful. The fact that Bendix divisional engineers meet yearly is considered excellent.

Engineering has a budget and cost control system which allows reasonably wide latitude in the expenditure of funds as deemed necessary to accomplish the job at hand. This budgetary policy is another cause of the favorable engineering atmosphere at Scintilla.

8.21 General Engineering Functional Activities. The Engineering Department is subdivided organizationally into the Design Group (Department 90), the Laboratory Group (Department 91) and the Experimental Manufacturing Group (Department 92). This department grouping is somewhat arbitrary due to the different character of the functions performed by the sections within each group.

The primary function of the Design Group is to develop new and improved product designs. The project engineers within the sections of the Design Group are responsible for not only developing the design, but also for coordinating all phases of the development of an assigned project. In this capacity he not only establishes the need for the utilization of the various service activities within the Engineering Department, such as the Research, Metallurgical, Test and Experimental Laboratories, but also oversees and co-ordinates such services. The informal, horizontal organizational ties created by virtue of the project engineers' authority to deal directly with such activities causes considerable resistance to the normal vertical lines of authority, particularly regarding the establishment of pro-

ject priorities and the orderly processing of work within each service activity. Some organizational cross-flow is recognized as essential for optimal efficiency, but some observable lack of control over scheduling, assigning priorities and timely project processing by an authority higher than the individual project engineers appears to be significant. Equally significant within the Design Group is the wide latitude of independence exercised by each design section in all phases of its activities, from the decision to initiate projects to matters of customer relations and determining the need for altering its internal organizational structure. As a result, considerable non-uniformity between the structure of the various design sections is noted. For example, within the Fuel Injection Section, not only is independent research, drafting, test and experimental laboratory activity provided for, but also the personnel assignment and review is carried on independently. Such activities operating independently of the established services of the Research, Test, Experimental and Administration Sections are all recognized as potential sources of duplication of services, facilities and engineering talent, in addition to making centralized control over priorities, schedules, co-ordination and standardization extremely difficult. In this respect, the ultimate in design control, coordination and effective utilization of facilities would appear to be the utilization of the service facilities by all design sections when possible; and to provide for expanding or altering the service activities to meet the changing needs of the Department, rather than each individual section having the prerogative of altering its own internal organization and providing for its own services as it feels the need. Increased control in the field of scheduling, establishment of priorities and a more universal utilization of the service facilities might be more effectively promoted by providing an additional level of design management over the Design Group. Hence, the position of Assistant Director for Design has been included in the proposed organization shown in Chapter 1. Such a move would also effectively reduce the large span of control of the Director of Engineering and would, in addition, provide a centralized communications link between the design phase and other Departments.

The proposed organization would also divorce the Administration and Field Engineering Sections from their present association with the design sections as is inferred by their present position under Department 90. The Administration Section function is essentially one of administrative

responsibility for non-specialized functions common to more than one Section. The proposed organization shows this section as a staff function directly under the Director of Engineering. Hence its function as a co-ordinator of administrative matters in a way which emphasizes its overall scope and need for additional authority to carry out its vital functions is portrayed. Proposed changes to the internal structure of the Administration Section will be discussed later.

Likewise, the present association of the Field Engineering Section with the Design Group as a member of Department 90 is not indicative of its function as an agency of co-ordination and liaison between the Engineering Department and outside field activities. Organizational association by virtue of insurance coverage appears to be the justification for this and other departmental relationships in the present organization. However, this justification appears partly nullified by the existence of laboratory and test facilities within the Fuel Injection Section. It is felt that the formal organization can serve a greater usefulness by associating sections according to function, responsibility and authority. Hence, the proposed organization has disassociated the Field Engineering Section from the Design Group and placed it as reporting directly to the Director of Engineering. It is to be noted that this organization change would completely relieve the Field Engineering Section of any design function or control over any design activities, all of which would fall under the Assistant Director for Design. The partial control presently exercised by the Field Engineering Section over the design of Ignition Analyzers would be dissolved.

8.22 Design Group. The decision to commence a particular project in the Design Group is largely determined by the individual design sections as a result of customer request. Normally, committee action or high level decisions are not required unless the customer requirement is of an unusual nature or of high cost, or unless the customer is relatively unknown. The utilization of the Engineering Project Request (EPR), formerly the vehicle by which all customer requirements were approved by the Director of Engineering and the General Manager, is no longer mandatory. It is noted, however, that Standard Practice No. 19 which authorized the commencement of a project only use of the EPR, has not been altered in accordance with this policy change. Likewise,

the New Products Committee, often referred to by all levels of design management as a vital force in the evaluation of customer requirements, has not been utilized for over a year. The need for the evaluation of customer requirements is apparently no longer considered appropriate for committee type action, as the functions of the New Products Committee have not been taken up by any other organized committee or meeting. Thus, the responsibility for practically all matters of design policy and evaluation of customer requirements have gravitated to the Chief Engineers of the Design Sections. Their decisions in such matters are subjected to critical review by higher authority after a project has commenced.

After a project has been assigned to a project engineer, the decision is made whether to have the job followed closely by the Job Progressing Unit under the General Administration Section. A complete discussion of the job progressing and cost accounting control is made in Section 8.4.

The requirement for maintaining a smooth working relationship with the customer and other Divisional Departments is a vital part of the efficient operation of the Design Group. This requirement tends to cut across the vertical lines of organizational authority and promotes the autonomous nature of the design sections. The necessity for such a degree of independence, however, appears to have spread to many other phases of the operations of the design sections. Such independent activities, as previously mentioned, appears to have created a need for some increase in control over, and unification between, the design sections. Such a unifying force has been proposed in the creation of the position of Assistant Director for Design in the proposed organization. This position would unify as much as possible, standard practices, control the allocation of drafting personnel from the Drafting Pool to the various Sections, serve as a unifying agent for design policy and long-range design planning, and act as a co-ordinating agency for communications with the Sales, Service and Manufacturing Departments.

Particular deviations from standard practices are noted in the Fuel Injection and Connector Sections, the former having previously been mentioned. The Connector Section has had many problems relevant to its rapid growth; it is significant to note that deviations from established systems have been necessary for the solution of some, in

certain cases to the point that the control systems built into the blueprint processing and distribution have been by-passed. Significant in this respect is the Advanced Drawing Release, by which prints are sent to Production prior to release, to be followed up by the normal release procedure which is too slow to be initially utilized. There is a recognized need for such swift action, although it might be more advantageous to revise the existing formal release system to accommodate existing conditions, rather than to by-pass the important formal release procedure. It is felt that perhaps considerable inflexibility characterizes the recording and release procedures, thus leaving no alternative but to treat connector problems as unique special situations. Another type of special case in the Connector Program, to be mentioned again in Section 8.242, concerns the independent control of original prints, and direct coordination between the Connector Design Section and the Manufacturing Department on Phase A items, thus by-passing the control of prints by the Blueprint Room when it is felt that such prints can be more efficiently handled.

Also significant is the mushrooming of classification systems for various series of connectors which appears to be virtually uncontrolled. This departure from the standardization concept by an individual design section has brought about increased emphasis on differences in design features, rather than on similarites. For example, arrangements have been made with the Signal Corps for a distinct classification system for the SR series rack and panel connectors, the AN type ordering system is utilized for the ordering of AN and CB series connectors, a different classification system is utilized for ordering Pigmy Connectors, the Bendix part numbering system is used for ordering CF, RB, W and O series connectors, modified in part by the AN classification system. In all, the Bendix part numbering system has designated approximately 150 different connector series, about 50 of which have been designated in the last six months. All parts which are ordered by a system other than by the Bendix Part Number also have a corresponding Bendix Part Number to which all numbers must be converted, since all print numbering and manufacturing is performed according to the Bendix part numbering system. Hence, it appears that the great variety of systems by which customers may order, and the variety of series of Bendix Part Numbers, due to the sequential nature of the system, obscures the many similar design features of the various series. This inadequacy is reflected in many phases of Divisional ac-

tivities, significantly in the Engineering, Sales and Manufacturing Departments.

It is felt that the above connector classification problems could have been contained by the Engineering Department more efficiently, had greater advanced planning dictated the need for changes in existing systems. In this respect, two significant points become obvious. First is that all connectors presently manufactured could be contained in one classification system. Secondly, the present IBM equipment is regarded as a limiting factor on improvements which have been proposed, and the utilization of this equipment for the promotion of design standardization has not yet been sufficiently exploited. Standardization is further discussed in Section 8.6.

8.23. Field Engineering. The basic function of the Field Engineering Section concerns the field testing and customer relations associated with field testing the products of the Engineering Department. Since this activity is different in scope from the other sections of the Engineering Department, the proposed organization, as shown in Chapter I, disassociates Field Engineering from its present organizational association with Department 90 and places it as reporting directly to the Director of Engineering, as has been previously discussed.

In addition to its basic function of field testing Phase A prototypes, Field Engineers are called upon to act as liaison representatives of the Division regarding other engineering matters and in instances, with Sales and Service Department matters, particularly when Sales and Service Representatives are not immediately available in the field. Information concerning only the Engineering Department is brought from the field directly to the cognizant sections of the Engineering Department. Information from the field relating to the Sales and Service Departments is relayed by memorandum, informal notification, or through the Service Meetings to the cognizant departments. The Field Engineering Section also serves the Engineering Department in the field in matters of design changes, proposed products, and acts in many situations a distributive agency for the Records Section. In this latter capacity, the Field Engineering Representatives aid in negotiating with customers for the establishment of distribution schedules suitable to the needs of the customer and to the distribution policy of the Engineering Department.

The degree of overlap between the Field Engineering Representatives and the Sales and Service Representatives suggests a potential requirement for increased co-ordination of a more established and formal nature than which presently exists. This interaction is further discussed in Chapter IX.

8.24 General Administration. The General Administration Section is characterized by a highly intelligent and ambitious approach to the various functions of the Engineering Department which require co-ordinative efforts, controls over activities within the Department, services common to activities within the Department, and co-ordination with other Departments. It is intended to act as a control point for all projects progressing through the Engineering Department, to assure their timely completion, conformance to standardized practices and drafting procedures, conformance to specifications, and to provide centralized control over collecting and checking designs. It has the responsibility for handling changes to existing designs, producing and distributing finished prints to activities within and outside the Division, and it represents the Department in matters involving co-ordination with other Departments.

The potential effectiveness of this section in carrying out its assigned functions appears to be partially unrealized by virtue of some under-delegation of authority commensurate with its assigned mission. That such a vital area should be in any way regarded as a "catch-all" by engineering management for various miscellaneous activities difficult to place with other sections, would appear to be an underestimation of its potential as a powerful and necessary control and co-ordinative agency.

It appears that a certain degree of apathy exists within the various design sections toward such outside control in matters of standardization of methods, design, job progressing, expediency in processing Engineering Changes, conformance to established methods for making up parts lists, and adherence to schedules and "paper" priorities. Such resistance to a relatively non-technical control body is recognized as inherent to creative engineering endeavors. In view of this, it might be advantageous to review the functions of the Administration Section in order to examine how certain of these functions of a control nature might be more effectively integrated with the activities of the Sections to which they apply. It is immediately observed that certain of the duties, namely standardization, drafting,

and cams, gears and breakers are functions that are closely associated with the Design Group.

The proposed organization places the four design sections under the Assistant Director for Design in order to build into the organizational structure increased systems control, co-ordination and standardization from within the Design Group. It is felt that moving these functions to staff positions under the Assistant Director for Design would not only place them as an integral part of the Design Group, but also in a position to promote optimum utilization of their facilities. More specifically, standardization would be made an integral part of the design phase as contrasted to its present role as somewhat of an external control; the utilization of drafting personnel would be subject to optimum control and utilization by its apportionment from within the Design Group by an authority higher than the individual design sections; the cams, gears and breakers development group would fall organizationally under the Standards Unit. Expansion of the Standards Unit would be provided for and will be further discussed in Section 8.6.

The above re-allocations of some of the present functions of the General Administration Section would leave the section with only functions of a more predominantly administrative nature which apply more generally to all sections, namely, Records and Blueprints, Specifications and Technical Writing, Job Progressing, Cost Control, Engineering Changes, Education and Training Personnel. In addition, the Administration Section would be assigned the management of the library, which exists for the benefit of all sections in the Engineering Department.

In order that the Administration Section be provided with increased status and authority commensurate with its responsibilities it is recommended that it be re-located organizationally to a staff function directly under the Director of Engineering. This move is proposed in recognition of the need for the section to receive additional support by design management for its vital role as co-ordinator, controller and administrator.

8.241 Drafting. The drafting and designing force is set up to function on a pool basis for all of engineering under the supervision of the Drafting Supervisor. However, the drafting pool concept has been appreciably altered by the permanent

allocation of draftsmen and designers to individual design section supervisors. When so assigned, the Drafting Supervisor has no cognizance over their work assignments. Actually at the present time, the pool consists of only three trained men and six trainees, plus a sprinkling of outside contract men. It seems to serve mainly as a training ground for the draftsman training program and for over-all control of the checking function.

A considerable portion of the drafting workload is accomplished by utilization of subcontracted service. Often these men do their work at Scintilla and often they are assigned directly to the various design groups. The present method of co-ordinating all contract requests for these services through the Drafting Supervisor is considered wise; hence the character and amount of the work being subcontracted can be carefully monitored.

It is considered that the practice of letting a majority of the drafting force be detached from the direct cognizance of the Drafting Supervisor makes it more difficult for him, and indeed all groups, to most profitably meet variations in drafting work load. It would also appear that the allocation of draftsmen and the heavy program of subcontracting work makes the training and promotion of qualified checkers difficult. A shortage of checkers can lead to the use of unchecked drawings as is done in Experimental Manufacturing, and can be a major source of delay. Continued attention to a checker training program is considered essential.

A flow diagram of work from the design stage through the drafting stage is presented in Section 8.5.

In order to study the time distribution of the average draftsman's work day, a statistical work sampling study was conducted. All main drafting area personnel were observed at random times over the course of one whole working day for each of four days. To assure a homogeneous sample group, all drafting trainees and personnel of Design Engineer or Designer categories were excluded.

At each observation the man was performing one of the following work elements:

Pencil in hand working
Reading or thumbing through prints or books
Talking
Idle
Missing

Neither the men nor the Supervisors had advance knowledge that the survey was being conducted. It is recognized at the beginning that a man talking may as well be talking about the job as about something more frivolous, but it was also recognized that a man bent over his drafting board may not necessarily be working. However, this type of work element classification based entirely on casual observation was necessary in order to conduct an unobtrusive work sampling.

To make the survey more useful, observations were separated according to the work supervision grouping of the various personnel as follows:

Personnel assigned to Connector Section
Personnel assigned to Jet Section
Personnel assigned to Reciprocating Section
Personnel assigned to Drafting Section
Non-Scintilla personnel (these people were actually under the work supervision of one of the above groups)

The percentage distribution of work activity for each group was computed separately as shown on Chart 8-1. In addition, the daily observations were totaled for the whole group and daily computations of percentage work activity as well as percentage error from the true percentage were made, as shown on Chart 8-1 and plotted on Figures 8-1 and 8-2. The percentage error values were computed at the $2\sigma$ (2 standard deviation) limit of the distribution of the theoretical universe of values of the various work activity samples. In some cases the percentage error is still rather high. This percentage could be brought within any desired range merely by taking additional samples. For example, we could attain $\pm 10\%$ accuracy on the work activity of Idle by continuing our observations to $N=4(1-P)/.01P$. With P approximately equal to 5.2% we would require 7300 total observations, or 5516 more.

The below summary is presented for the information of engineering management with no attempt to judge the appropriateness of the work activity allocation.

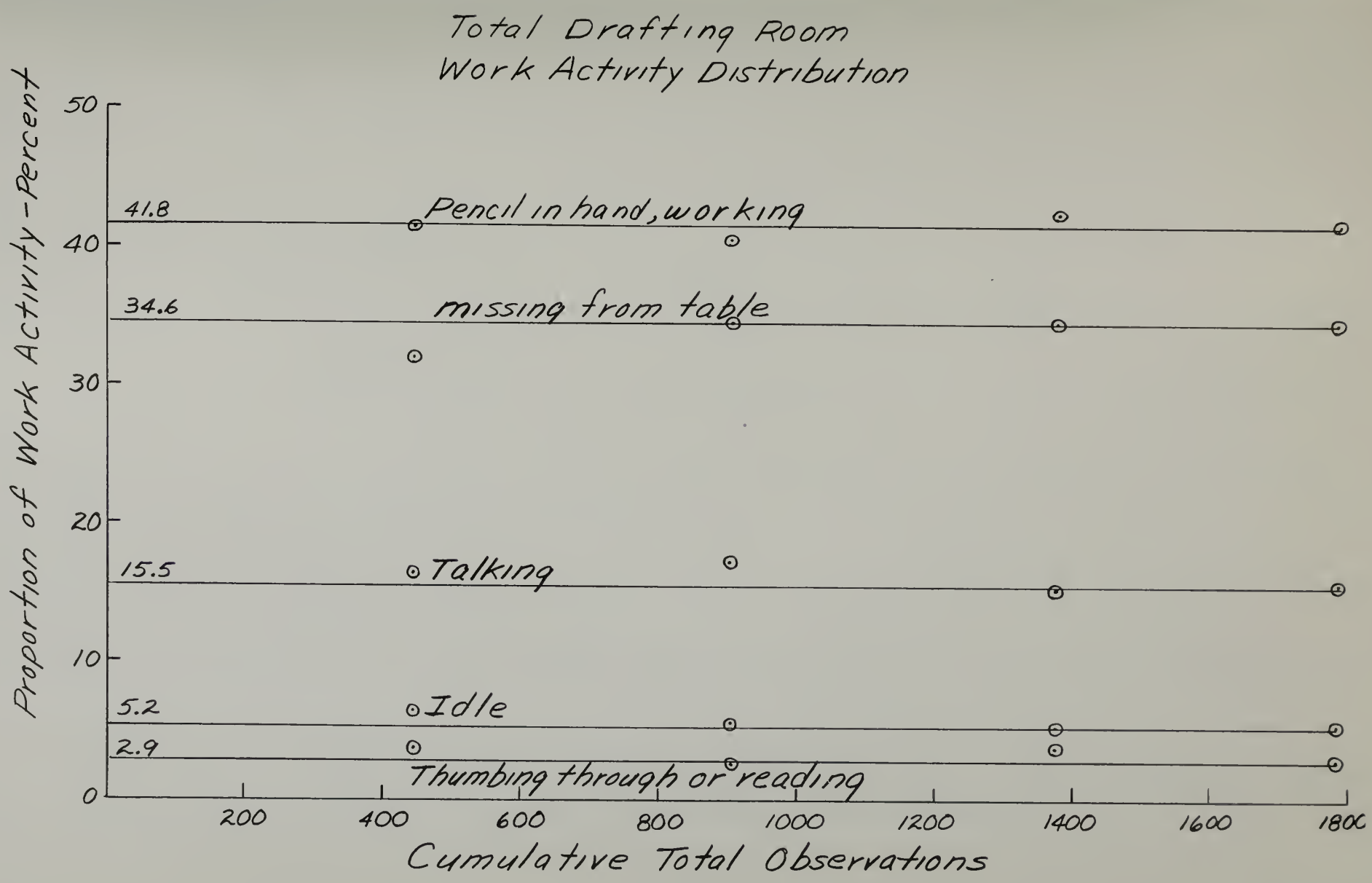

Total Drafting Room
Work Activity Distribution
Proportion of Work Activity - Percent
50
40
30
20
10
0
41.8
Pencil in hand, working
34.6
missing from table
15.5
Talking
5.2
Idle
2.9
Thumbing through or reading
200
400
600
800
1000
1200
1400
1600
1800
Cumulative Total Observations

Figure 8-1

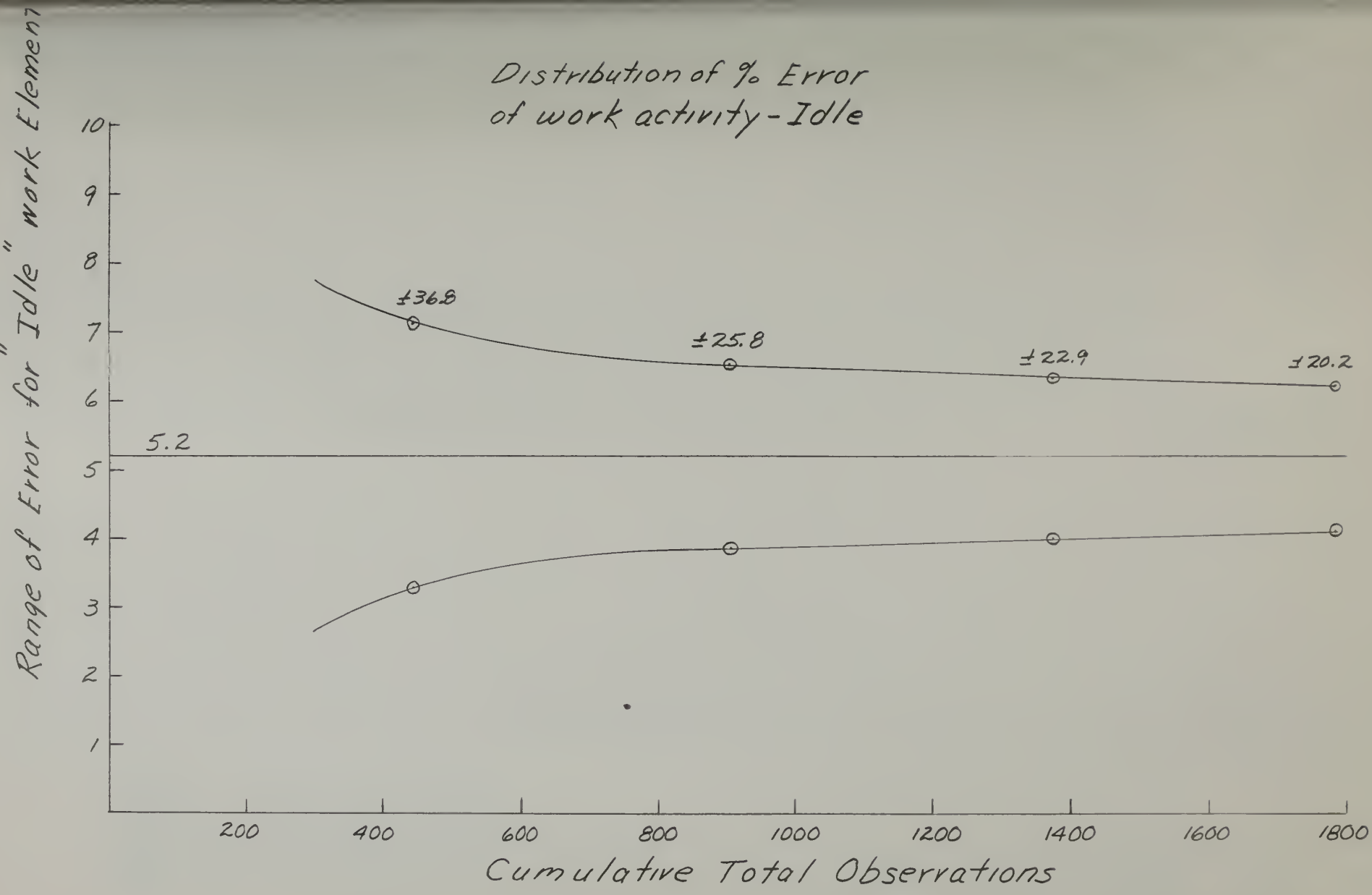

Distribution of % Error
of work activity - Idle
Range of Error for "Idle" work Element
10
9
8
7
6
5
4
3
2
1
±36.8
±25.8
±22.9
±20.2
5.2
200
400
600
800
1000
1200
1400
1600
1800
Cumulative Total Observations

Figure 8-2

CHART 8-1

# DRAFTING ROOM PERSONNEL WORK ACTIVITY DISTRIBUTION

ELEMENTS:
- W - Pencil in hand, working
- R - Thumbing through or reading
- T - Talking, conversing
- I - Idle
- M - Missing
- C - Cumulative observation

| | ELEMENT | OBSERVATIONS FIRST DAY (3/12) | PROPORTION OF WORKING DAY-% | % ERROR-FIRST DAY | OBSERVATIONS SECOND DAY (3/19) | CUMULATIVE END SECOND DAY | PROPORTION OF WORKING DAY-% | % ERROR-2ND DAY (CUMULATIVE) | OBSERVATIONS THIRD DAY (4/2) | CUMULATIVE END THIRD DAY | PROPORTION OF WORKING DAY-% | % ERROR-3RD DAY (CUMULATIVE) | OBSERVATIONS FOURTH DAY (4/9) | CUMULATIVE END FOURTH DAY | PROPORTION OF WORKING DAY-% | % ERROR-4TH DAY (CUMULATIVE) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONNECTOR SECTION | W | 50 | 48.5 | | 29 | 79 | 43.5 | | 40 | 119 | 43.9 | | 32 | 151 | 44.4 | ±12.1 |
| | R | 2 | 1.9 | | 2 | 4 | 2.2 | | 0 | 4 | 1.5 | | 2 | 6 | 1.8 | ±80.0 |
| | T | 15 | 14.6 | | 16 | 31 | 17.1 | | 8 | 39 | 14.4 | | 13 | 52 | 15.3 | ±25.6 |
| | I | 2 | 1.9 | | 4 | 6 | 3.3 | | 2 | 8 | 3.0 | | 1 | 9 | 2.6 | ±66.2 |
| | M | 35 | 33.0 | | 26 | 61 | 33.6 | | 40 | 101 | 37.3 | | 21 | 122 | 35.9 | ±14.5 |
| | C | 104 | | | 77 | 181 | | | 90 | 271 | | | 69 | 340 | | |
| JET SECTION | W | 46 | 32.0 | | 78 | 124 | 38.5 | | 61 | 185 | 38.5 | | 61 | 246 | 38.9 | ±10.0 |
| | R | 4 | 2.8 | | 1 | 5 | 1.5 | | 6 | 11 | 2.3 | | 4 | 15 | 2.4 | ±50.9 |
| | T | 27 | 18.9 | | 34 | 61 | 18.9 | | 23 | 84 | 17.5 | | 19 | 103 | 16.3 | ±18.0 |
| | I | 17 | 11.8 | | 9 | 26 | 8.1 | | 7 | 33 | 6.9 | | 7 | 40 | 6.3 | ±30.6 |
| | M | 50 | 34.6 | | 56 | 106 | 33.0 | | 61 | 167 | 34.8 | | 62 | 229 | 36.2 | ±10.5 |
| | C | 144 | | | 178 | 322 | | | 158 | 480 | | | 155 | 633 | | |
| DRAFTING RECIPROCATING SECTION | W | 39 | 41.9 | | 25 | 64 | 34.6 | | 58 | 122 | 40.8 | | 29 | 151 | 39.3 | ±12.7 |
| | R | 6 | 6.5 | | 4 | 10 | 5.4 | | 7 | 17 | 5.7 | | 4 | 21 | 5.5 | ±42.3 |
| | T | 16 | 17.2 | | 14 | 30 | 16.2 | | 15 | 45 | 15.1 | | 20 | 65 | 16.9 | ±22.6 |
| | I | 3 | 3.2 | | 5 | 8 | 4.3 | | 5 | 13 | 4.4 | | 7 | 20 | 5.2 | ±43.5 |
| | M | 29 | 31.2 | | 44 | 73 | 39.5 | | 29 | 102 | 34.1 | | 25 | 127 | 33.1 | ±14.5 |
| | C | 93 | | | 92 | 185 | | | 114 | 299 | | | 85 | 384 | | |
| DRAFTING POOL | W | 18 | 74.9 | | 14 | 32 | 65.3 | | 16 | 48 | 65.8 | | 16 | 64 | 67.3 | ±14.3 |
| | R | 1 | 4.2 | | 1 | 2 | 4.1 | | 1 | 3 | 4.1 | | 0 | 3 | 3.2 | ±112.8 |
| | T | 1 | 4.2 | | 3 | 4 | 8.2 | | 3 | 7 | 9.6 | | 1 | 8 | 8.4 | ±67.8 |
| | I | 1 | 4.2 | | 0 | 1 | 2.0 | | 0 | 1 | 1.4 | | 0 | 1 | 1.1 | ±184.5 |
| | M | 3 | 12.5 | | 7 | 10 | 20.4 | | 4 | 14 | 19.2 | | 5 | 19 | 20.0 | ±41.0 |
| | C | 24 | | | 25 | 49 | | | 24 | 73 | | | 23 | 95 | | |
| OUTSIDE SERVICE | W | 30 | 37.5 | | 36 | 66 | 39.3 | | 42 | 108 | 42.5 | | 27 | 135 | 40.6 | ±13.2 |
| | R | 4 | 5.0 | | 0 | 4 | 2.4 | | 0 | 4 | 1.5 | | 2 | 6 | 1.8 | ±82.3 |
| | T | 12 | 15.0 | | 15 | 27 | 16.1 | | 6 | 33 | 13.0 | | 16 | 49 | 14.8 | ±26.4 |
| | I | 5 | 6.3 | | 6 | 11 | 6.5 | | 6 | 17 | 6.7 | | 5 | 22 | 6.6 | ±41.4 |
| | M | 29 | 36.2 | | 31 | 60 | 35.7 | | 32 | 92 | 36.2 | | 28 | 120 | 36.2 | ±14.6 |
| | C | 80 | | | 88 | 168 | | | 86 | 254 | | | 78 | 332 | | |
| TOTAL | W | 183 | 41.3 | ±11.3 | 182 | 365 | 40.6 | ± 8.1 | 217 | 582 | 42.3 | ± 6.3 | 165 | 747 | 41.8 | ± 5.7 |
| | R | 17 | 3.8 | ±47.2 | 8 | 25 | 2.8 | ±38.9 | 14 | 39 | 3.8 | ±27.2 | 12 | 51 | 2.9 | ±27.4 |
| | T | 71 | 16.5 | ±21.6 | 82 | 153 | 17.1 | ±14.7 | 55 | 208 | 15.1 | ±13.7 | 69 | 277 | 15.5 | ±11.1 |
| | I | 28 | 6.4 | ±36.8 | 24 | 52 | 5.8 | ±25.8 | 20 | 72 | 5.2 | ±22.9 | 20 | 92 | 5.2 | ±20.2 |
| | M | 146 | 32.0 | ±13.8 | 164 | 310 | 34.5 | ± 9.2 | 166 | 476 | 34.6 | ± 7.4 | 141 | 617 | 34.6 | ± 6.5 |
| TAL | | 445 | | | 460 | 905 | | | 472 | 1377 | | | 407 | 1784 | | |

| | Total Engineering | Connector Section | Jet Ignition Section | Reciprocating | Drafting Pool | Subcontracted Service |
|---|---|---|---|---|---|---|
| Working | 41.8 | 44.4 | 38.9 | 39.3 | 67.3 | 40.6 |
| Reading | 2.9 | 1.8 | 2.4 | 5.5 | 3.2 | 1.8 |
| Talking | 15.5 | 15.3 | 16.3 | 16.9 | 8.4 | 14.8 |
| Idle | 5.2 | 2.6 | 6.3 | 5.2 | 1.1 | 6.6 |
| Missing | 34.6 | 35.9 | 36.2 | 33.1 | 20.0 | 36.2 |
| Total % | 100. | 100. | 100. | 100. | 100. | 100. |

8.242 Records Section. The Records Section, one of the major functions under the General Administrative Section, acts as a releasing agency for the Engineering Department, handling the distribution of prints, material lists and changes to inter-plant activities, military and non-military customers. In addition, it maintains meticulous records of all distribution lists, engineering changes, Phase B production released items, and parts lists. In carrying out these functions, the Records Section acts as a collecting point for the end product of the Engineering Department, namely, finished drawings, parts lists and specifications.

The Records Section commences action on a particular project in many cases prior to completion of the finished drawings by the Design Group. In this respect it assumes the role of a job progressing agency for the final stages of design, in that it follows up delinquent drawings

by publishing a Weekly Delinquency Report which calls out items which are holding up a release and the reason for the delay of items which are unavailable from the checking stage. This follow-up is conducted independently from the Job Progressing unit, which is also under the Administrative Section. In this respect it appears that the Records Section is performing a control function in the final stages of Engineering design which might more logically fall within the scope of the Job Progressing function and which might be expanded to include a closer control by that body in all stages of engineering design, instead of only in the final stages as is presently done. This would provide a more sure and uniform progressing of all projects, as presently, the means by which the Records Section becomes aware of an impending project is through any one of several miscellaneous channels, namely, through conference reports or instructions, the Estimate Request, the Advanced Digest published by the Sales Department, through memoranda from the Project Engineer involved, or other sources. In some cases, actual submission of the finished drawings may occur prior to notification, and thereby preclude follow-up and control by the Records Section in the final design phase.

For Phase B designs, History Cards, which specify distribution procedures, are made up for all parts which have not been previously released. The original drawings are then reviewed by the Tool Information Committee which determines whether the release will be in accordance with PPL, Class II or Class I tooling, or to delay the release pending contract or production eventualities. For a PPL release, parts lists are then checked by the Records Section for unreleased parts; unreleased drawings are checked for unreleased specifications and all drawings and specifications not previously released are then released by the Records Section. For a Class II Tooling release authorization, parts lists are checked for unreleased parts or for previous release to PPL, unreleased drawings are checked for unreleased specifications or for previous releases to PPL, and all drawings and specifications not previously released or which were previously released to PPL only are released to Class II Tooling. For a Class I Tooling release, parts lists are checked for unreleased parts or previous release on PPL and/or Class II Tooling, unreleased drawings are checked for unreleased specifications or previous release to PPL or Class II Tooling. Prints are then released to Comments by Production, the release being held up until the return of the Comment Sheet which is relayed to the cogni-

zant project engineer for any design alterations which might be required. The project engineer then authorizes the release as scheduled and all drawings and specifications not previously released are released to Class I Tooling. This procedure is altered if the Tool Information Committee authorizes the release to Comments and Class I Tooling simultaneously, in which case any comments which necessitate a change on a drawing or specification previously released to PPL or Class II Tooling require a formal change. Chart 8-4 graphically illustrates the above relationship.

Phase A items are not recorded by the Records Section, and, in the case of a Production Composite Contract, the cognizant project engineer works directly with Production, as set up by a Composite Contract Meeting called by the Factory Manager or Production Manager, and also attended by representatives of the Sales and Accounting Departments. The necessary blueprints are procured from the Blueprint Room, by-passing the normal functions of the Records Section and the Tool Information Committee. If, however, a customer requires to be furnished with prints of unreleased items, an S Issuance is authorized and a History Card is kept to provide for automatic follow-up on subsequent changes or other relevant publications, such changes differing from changes on released items in that only the approval of the cognizant project engineer is required.

The distribution of prints and changes is in compliance with ANA 390-91, standard procedures and/or customer requirements. Automatic Follow-Up Cards are maintained for customers and subcontractors, and include provision for automatic follow up to military customers except when distribution is authorized by Air Force Table 250 which specifies print and van-dyke distribution. Non-standard and fluctuating customer requests for the type of distribution opposes the utilization of automatic equipment for distribution purposes.

The Records Section also controls recording of Engineering Changes in addition to their distribution, for Phase B items, and for Phase A items on Special Issuance as mentioned above. In addition to maintaining complete distribution records, the Records Section also maintains records of the requirements for customer approval requirements for Class I (development) changes and Class II (manufacturing) changes, and keeps the Production Liaison Group advised of such requirements so that they can process the changes accordingly.

The Records Section maintains thorough parts lists records. In its capacity as a collecting and releasing agency for prints and parts lists, it has made available to the Design Group Grouped Parts Lists, i.e., established groupings by major components in tabulated form when such standard components can be used on various units, so that the project engineers merely have to refer to a particular part of a grouped list. This represents a considerable saving to the Design Group when such grouped components apply to a particular design, as it eliminates the need for making up the laborious Running Parts Lists. The preparation of Running Parts Lists may also be avoided in cases of similarities to previous parts lists, in which case such previous parts lists may be called out, noting only the additions and/or omissions. The utilization of these efficiency measures appears to be the initial stage of a program which, in the future, might provide for the tabulation of all previous design elements, thus promoting ready accessibility of all previous designs of all design sections to project engineers, designers and draftsmen. If such a program might incorporate the utilization of IBM cards for calling out parts requirements and classifying designed parts, design standardization would be enhanced and variations from standard practice in the preparation of parts lists might be avoided. Measures of this type have been under consideration in the program of gradual increased utilization of IBM equipment by the Division. However, the program of adoption of such equipment to the existing needs of the Engineering Department, if such a program exists, appears to lag that of other Departments. Hence, although the potential contribution of such equipment appears to be realized, its adoption to date appears to be non-existent.

Basic to the above-mentioned program is the need for a re-evaluation of the Bendix part numbering system and the various classification systems now in use. This problem will be discussed in Section 8.6.

Finally, the close and effective control by the Records Section over blueprint distribution within the Division appears exceptionally noteworthy. Careful records are maintained of all prints which have been released to Central Files, so that all copies are kept current to prevent obsolete prints from remaining in circulation. Thus, when a change replaces certain prints, the obsolete prints are recalled, accounted for, and destroyed. Likewise, when an item goes out of production, all but one set of prints are recalled and inactivated, the one set remaining in Central

Files. If the unit is re-ordered at a later date, Production submits an order to the Engineering Records Section through the Production Engineering Co-ordination Group. Hence, the Engineering Department is the sole source of prints for the Manufacturing Department.

One potential source of a lack of centralized control of blueprints is noted in the manner by which the Connector Section has been authorized to retain certain original prints, and by which they appear to control distribution in a manner somewhat independent of the Records Section; thus, in effect, by-passing the control features built into the system of blueprint control. For reasons of expediency, this practice of by-passing the Records Section, whereby the Connector Design Section deals directly with Production, has apparently been authorized, but the potential repercussions in the future of such by-passing of systems and decentralization of blueprint control, if allowed to continue and expand, should be recognized. In this regard, perhaps emphasis might well be placed on altering the processing techniques of the Records and Blueprint groups in order to make every effort to accommodate the demand for expediency in certain products, rather than to sacrifice established control features of the Records Section.

8.243 Material Review and Corrective Action. The Scintilla approach to the problem of solving production floor difficulties is considered excellent. Basically, this approach recognizes adjustments will be necessary and sets up the proper liaison to take speedy action with a minimum of paperwork.

This liaison work is assigned to one man as a full-time responsibility thus relieving individual project engineers of constant interruptions over minor production problems

relating to their respective designs.

This approach indirectly serves as a continuing tolerance review but has the disadvantage of being effective only after trouble has developed in production. It is felt that additional emphasis need be placed on tolerance review and other more general aspects of manufacturing producibility early in the design stage. These aspects will be discussed in Section 8.7 on Co-ordination. The liaison provided by the Material Review Board and the Corrective Action Committee will also be more fully discussed in Section 8.7.

8.244 Engineering Changes. The main problem pointed out for investigation by top engineering management was that of expeditious processing of engineering changes. Accordingly this matter was given detailed attention.

The engineering change group (Production Liaison Group) appears to be an efficiently organized group even to the extent of having its own draftsmen. Significantly, it is noted that this was one of the few areas that have formalized and explained the manner by which its assigned functions are accomplished through the issuance of Engineering Standards Manual instruction sheets and Scintilla Standard Practice No.8. In fact, the only flow chart seen on engineering matters was Standards Manual Sheet No.R10.0.1 on formal engineering change procedure. It was noted, however, that these instructions, comprising about ten different numbered pages, are rather difficult to read and require much referring back and forth. Some attention might be given to rearranging and consolidating this information into fewer and better integrated instructions.

Change requests can come from many sources but these sources seem reliable and capable of monitoring the change for appropriateness at the inception of the request. As proof of this, it is noted that only about 2% of the changes are discarded in their first review by the Change Committee.

The change record files were checked to determine if any significant delay points could be discovered within engineering. It is noted in the sampling distribution of figure 8-3 that the average time to process a change is 43.6 days from the date initially recorded by the Record Section

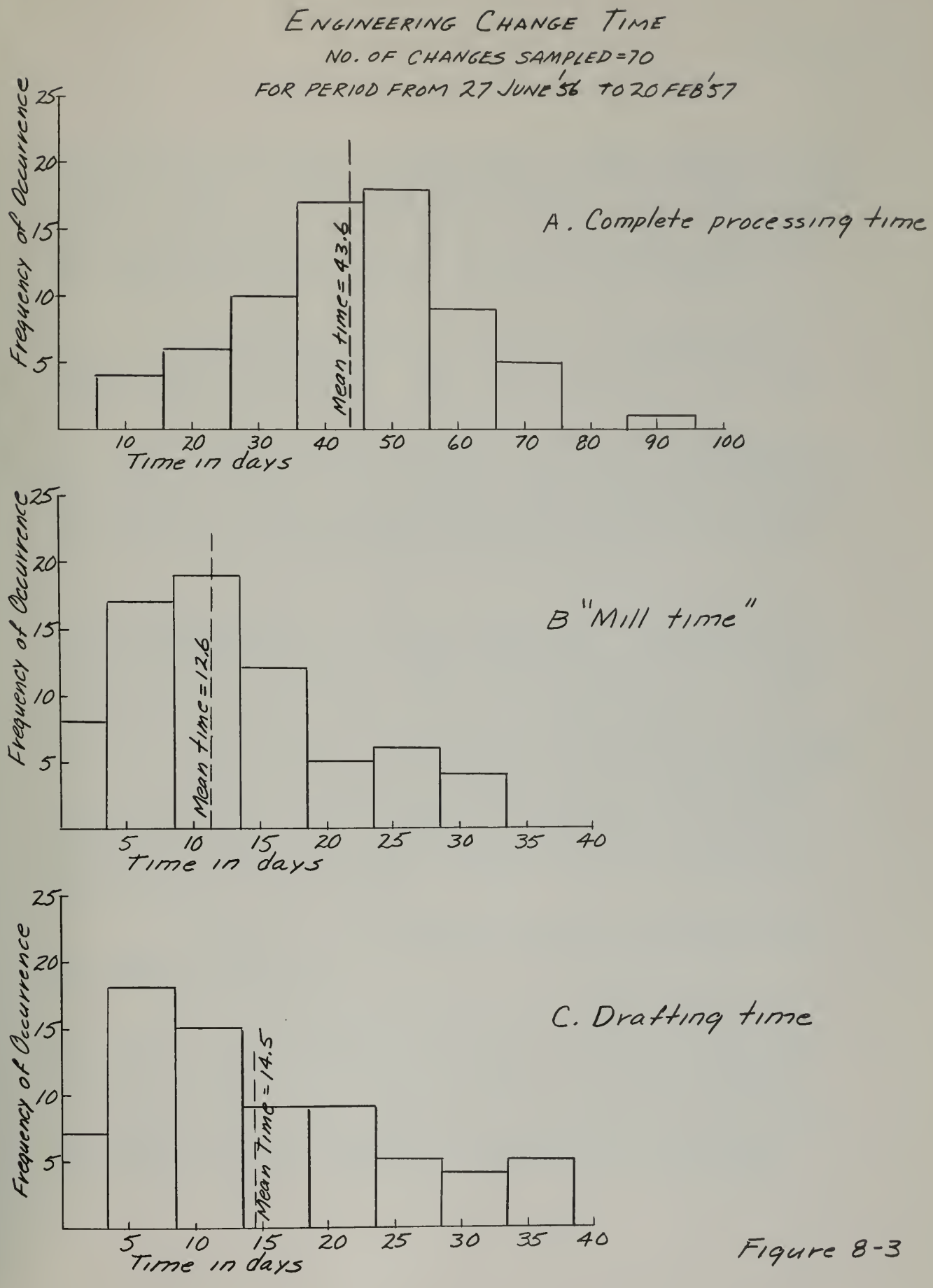

ENGINEERING CHANGE TIME
NO. OF CHANGES SAMPLED = 70
FOR PERIOD FROM 27 JUNE '56 TO 20 FEB '57
Frequency of Occurrence
Time in days
Mean time = 43.6
A. Complete processing time
Mean time = 12.6
B "Mill time"
Mean Time = 14.5
C. Drafting time

Figure 8-3

to the date of release of the change for distribution. Significant periods of time within this over-all processing time appear to occur in the stage designated as "mill time" by the Records Section, and in the drafting stage. The mean "mill time", on the basis of this survey, is 12.6 days, and the mean drafting time 14.5 days. Further investigation into the reasons for these time lapses might prove fruitful.

It can be said that an initial statement of a problem by management is more apt to be a revelation of symptoms than a diagnosis. This seems to apply very aptly to the engineering change problem at Scintilla.

It appears that the main trouble with changes is not so much the change procedure as it is the fact that there are too many changes. The problem then becomes one of doing everything possible to reduce the requirement for changes. This matter is discussed in Sections 8.4 and 8.7 under the subjects of Work Progressing and Co-ordination.

8.245 Specifications. This unit is responsible for converting the reports of the Test Laboratory and Materials Laboratory into specifications of the proper formal 9-series numbers and distribution. These specifications set up the requirements for the manufacture and inspection of a new product. To assist in this process, the appropriate specification number appears on engineering drawings as necessary. It was noted in this regard that the test of a new product had often not been completed and the specifications subsequently not written by the time the drawings were passed through checking. It has become practice under these circumstances to merely assign a number for which no specification has yet been written.

Liason is also required with the checkers on all drawings to assure that existing specifications cover all the design requirements.

It is Scintilla's practice to make conversion drawings for all technical information received from other companies for manufacturing purposes. Drawing and specification changes by the other company are first received by Scintilla Sales and then should be passed to the Specifications Unit for clarification and correlative work. The procedure is to make changes as necessary or to ask for suitable deviations. Trouble arises in that the project

engineers also get these changes and undertake informal liaison with the outside company to negotiate deviations. Quality Control at Scintilla points out that sometimes the other companies' engineer fails to change his own technical information as a result of his informal agreement and the Scintilla shipment is rejected on arrival. The Specifications Unit often does not get advised of these informal arrangements and cannot assure proper follow-up. It appears that a definite responsibility and procedure must be established in this regard.

8.246 Standardization. The Standardization Unit within the Administration Section is relatively newly formed and, although having performed notable services, has not as yet been given the authority or manpower to exploit its potential. Its contributions toward promoting standardization have mostly been in standardizing various items as screws, washers, etc., and incorporating resulting tabulated drawings into the Standards Manual. The decisions by which standard sizes are determined is based on military specifications, probability techniques and departmental requirements. In addition, it has promoted advances in establishing drafting and tolerance standards which are incorporated in the Standards Manual.

The provision for this group in the organizational structure, however, has not eliminated the independent policies of the individual design sections, and the need for greater unification of standards implimentation and policy is apparent.

Due to the importance of standardization in the major aspects of engineering activity, it is given additional attention in Section 8.6.

8.247 Job Progress. The duty of Job Progressing is considered by top engineering management to fall under the Job Progress Unit of General Administration. Careful attention was devoted to this area for it is believed that any engineering department needs to accept the fact that schedules are just as important to them as to the production shops.

Investigation showed that this unit concerned itself with just a small portion of the over-all scheduling and control problem through no fault of its own. Largely

because of lack of organizational status and of the varying attitudes regarding scheduling, this unit does little more than try to keep up with the scheduling activities of many individual project engineers, laboratories and the Records Section.

This situation is not by accident for the project engineers seem loath to accept assistance in this vital area even though the personnel study of Section 8.32 shows that the average project engineer spends 3.76 hours per week on this work. Before the project engineers would be willing to relinquish these duties, an effective and all-inclusive system would have to be developed and given top management support. A good system would improve over-all co-ordination and control and would have the secondary advantage in freeing the project engineer of a good portion of this work.

Because job progressing involves so many different areas, Section 8.4 is devoted to a complete study of the job progressing function.

8.251 Materials Laboratory. The Materials Laboratory has the responsibility of specifying, approving and testing of practically all materials used by the Division. In this capacity it not only co-ordinates closely with the Design Group and other laboratory sections within the Engineering Department, but also performs services for the Manufacturing, Purchasing and Quality Control Departments.

Within the Engineering Department its primary functions are to recommend materials, heat treatments, finishes and, in some cases processes when requested by the project engineers, draftsmen, designers, Research or Test Laboratories. It also assigns and approves drawing specifications prior to checking. The criteria for recommending and approving specifications is determined by the utilization of the laboratory facilities, which includes test equipment, complete records of past specifications and Standard Stock Material Lists. The latter facilitates the assignment of existing stock material whenever possible.

In addition to the above Engineering Department functions, the Materials Laboratory processes requests from the Production Planning Group for materials, heat treatments or plating substitutions or variations by originating an Off-Specification Authorization. This is routed for approval

to cognizant plant units prior to granting the authorization. The laboratory also approves Purchase Order Requisitions for materials, approves vendors, conducts government analyst procedures by sampling incoming materials for chemical, physical and metallurgical properties. It makes laboratory reports to cognizant departments and activities as required and requested.

The Materials Laboratory appears to operate extremely efficiently and in close harmony with the above-mentioned departments. No backlog reports are submitted due to the short duration of the majority of its investigations and the apparent promptness which is characteristic of its operations, and necessary by virtue of the nature of its services.

8.252 Research Laboratory. The Research Laboratory performs a service function for the Design Group by performing specialized research as requested. This research is more of the nature of applied research and is mostly specifically slanted toward the established needs of customers. Only a very limited amount of basic research is conducted in creative studies for which there is no application immediately foreseeable.

Work requests are received from the design sections usually by means of a rough sketch from the project engineer. The work is logged as a project, assigned a priority by the Research Section and assigned to a project engineer within the section. Work progressing is accomplished by assigning a Research Number to each job request in numerical sequence and assigning a due date. Concern over work progressing is particularly evident in the Research Section, although the system utilized is not part of any overall engineering plan. Weekly meetings are held within the Research Section by cognizant personnel to discuss progress, methods of attack and to evaluate test data for particular projects. Monthly meetings are held with the design project engineers to review progress, and in some cases to re-assign priorities.

In performing its investigations, the Research Section co-ordinates its efforts with the Experimental, Testing and Materials sections. In contrast to Experimental Manufacturing monthly progress and backlog reports, Research reports backlog directly to the Director of Engineering every six months. In this regard, it is noted that the Test Section makes no backlog report of work, nor does the Materials Section.

Outgoing information always takes the form of memoranda, diagrams, curves and/or complete formal reports depending on the extent and importance of the investigation. An appropriate filing system assures the orderly processing and distribution of these results.

8.253 Test Laboratory. The Test Laboratory serves mainly as a service function to:

a. Serve in a quality control capacity for engineering when something is made on a customer purchase order in Experimental Manufacturing. This is necessary because often the standards by which Quality Control would inspect have not yet been firmly developed. In this particular situation the quality control people in Experimental Manufacturing check the components as they are made.

b. Provide official qualification testing for new units.

c. Reporting final testing and inspection information used as a basis for manufacturing and quality control specifications. This service is provided for all design sections with the exception of Fuel Injection Section which does all its own work.

In addition, the Test Laboratory designs, in some cases manufactures, and maintains various types of special test equipment used in quality control work. This part of the laboratory is largely an autonomous shop that works mostly on work requested by Tool Design Group under the Manufacturing Department. This apparent mixing of work assignment is done to offset a shortage of properly qualified specialists in the Tool Design Group.

Newly designed units that have been manufactured by Experimental Manufacturing are automatically delivered to the Test Laboratory upon completion. The Laboratory decides what units need testing and the objectives of the test but try to establish informal liaison with the project engineer concerned regarding his requirements.

It has been stated before that reports of these tests serve as the basis for final manufacturing and quality control specifications. If a certain new unit is not tested here, it will be checked by Quality Control after manufacture under a regular purchase order. The decision not to test would at all times be based on the knowledge that the unit is similar enough to another unit so that no problem is foreseen and that existing specifications are applicable.

Reports of tests are written only as deemed necessary by the laboratory or as requested by the cognizant project engineer. The report describes the purpose of the tests, the procedure, the results and the recommendations of the laboratory. Follow-up on these recommendations is largely at the option of the individual project engineer. However, on matters that the Test Laboratory feel are of major importance, top engineering management may be asked to render a decision.

The biggest single problem that is observed in the Test Laboratory is the problem of completing test work at the time desired. The Test Laboratory feels that it doesn't have sufficiently good advance notice of testing requirements. In this regard, it is observed that they get a copy of the notice of experimental contract issued by Experimental Manufacturing. This notice estimates the date on which the new unit will be produced, fully tested, and ready for shipment. This apparent dichotomy seems a good place to start better co-ordination and work progressing.

The matter of liaison with project engineers is very informal and often they don't plan test requirements until the item is received in the Test Laboratory. So it can be seen that work load planning is very difficult in this area. This fact is not as critical as it might be for there is at present such a backlog of work built up that there is often a delay before test can begin. In fact, test work backlog for the Jet Section now stands at about six weeks. Of course, it must not be forgotten that the build up of backlog may be partially due to inadequate planning as a result of indefinite work progressing.

The Test Laboratory being last in the chain of events in the life of a new product could and does feel the pinch of time. Many units are already late when Test gets them. For example, one-third of the units under the cognizance of the Jet Ignition Section have already been

released to production on receipt by the Test Laboratory. This latter difficulty is attributed partially to the unrealistic assignment of completion as mentioned in Section 8.26. It can be seen that desirable design changes become increasingly difficult to justify and to process in a timely fashion under these circumstances.

In spite of the importance of this delay, it is interesting to note that work backlog reports are neither asked for nor sent to top engineering management. The Test Laboratory, however, does have its own internal report system.

As in the case of the Experimental Shop it is again noted that Test Laboratory is in the position of being under fire from numerous project engineers each one wanting his work done first. The Test Laboratory must perform the various projects according to its concept of relative priority. This situation could be, and probably is, the source of much friction.

8.26 Experimental Manufacturing. Experimental Manufacturing is essentially a shop activity with the major purpose of producing experimental or prototype units. Its personnel comprises approximately one-fourth of the total personnel of the engineering department. The shop is independent of the normal manufacturing activity of the plant and attempts to remain fully capable of producing any type of new unit or design required of them. The single exception is in the production of highly precision honed fuel injection prototype parts which are produced in production areas.

All Experiment Manufacturing personnel report to and are responsible to the Director of Engineering. The shop is in close proximity to the engineering spaces. These facts are considered to be very important and very desirable. Easy co-ordination and control over the hardware development stages of a new design cannot only save many engineering man-hours, but gives engineering complete control and responsibility for the time progressing of this vital first step.

The late completion of designs and tests on prototype or experimental units has been found to be causing problems in later phases of engineering and manufacturing activity, so the investigation of workload control and

progressing logically starts in Experimental Manufacturing.

The backlog of work in Experimental Manufacturing (which currently seems at a low point at 11 weeks of back work) consistently causes delays in the fabrication of new units. These delays which average about one month are recognized by Experimental Manufacturing at the inception of the contract by re-scheduling (with one class of exception to be discussed in a later paragraph) to a later and more realistic date. It must be noted that a spot-check of the files revealed that these re-estimated dates proved to be rather accurate. Of course, it is realized that many items counted in the backlog do not represent work that needs to be done immediately, and that urgent work can be given priority and pushed in ahead. However, the backlog does remain.

When establishing work contracts, Experimental Manufacturing gets only a requested completion date. These dates are requested by individual design groups according to their individual needs. Experimental Manufacturing is in the position of having to evaluate relative priority and schedule accordingly. For the most part, this is accomplished readily except for Jet Ignition Section projects. Re-scheduling of these project is vigorously resisted by the project engineers with the result that the project is scheduled for completion at an unrealistically early date.

The date estimated by Experimental Manufacturing is the shipping date. This means that the estimate must include time for test in the Test Laboratory. However, the Test Laboratory itself has a backlog (especially for jet ignition projects) and work often cannot begin as scheduled. As stated in Section 8.253 it is felt that there is insufficient work progress liaison between Experimental Manufacturing and Test Laboratory.

The magnitude of the delay in starting new projects is not evident in the monthly report submitted to top engineering management because the delay is represented only by a backlog figure. In-process delays are not even mentioned. In fact, the 15 pages of facts and figures seems far too detailed to be of real use to the Director. It is recommended that the information requirements of this monthly Activity Report be re-evaluated.

It was pointed out that certain units require materials that have long procurement times and that the backlog

therefore does not serve as a limiting factor in work progressing. The longest period of procurement time that might be expected on certain materials (especially hi-nickel alloys) was said to be three months. It can be seen, however, that this does not necessitate a total back-log of work requiring three months to complete.

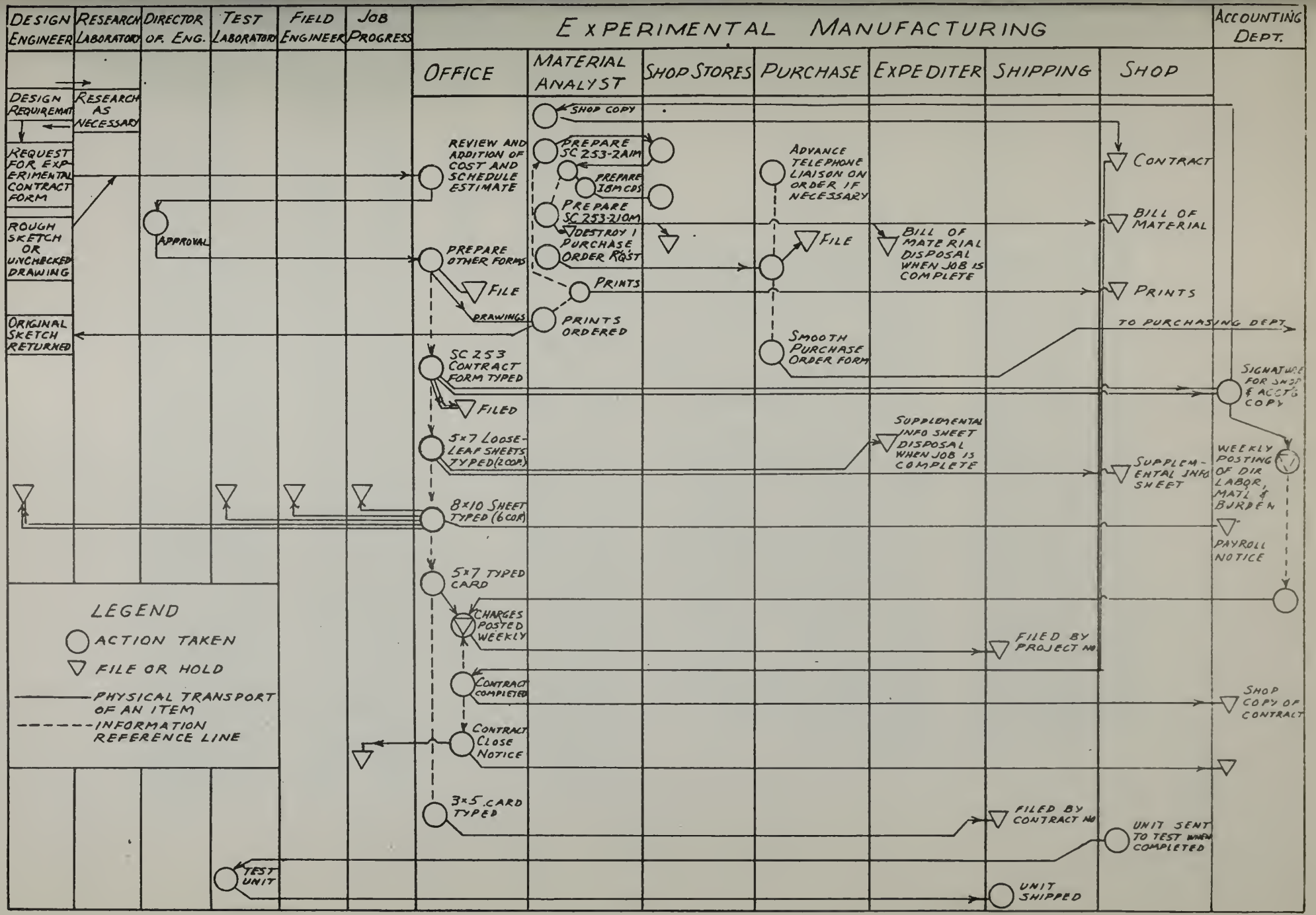
The current attempts of Experimental Manufacturing to increase productivity by obtaining additional people seems fully warranted. However, it should be pointed out that no study has been made of shop efficiency and productivity and it will be assumed to be at maximum. It has been noted that the shop normally works from sketches and rough drawings that have not been checked. It was estimated by management that because of these unchecked drawings about 5-10% of the shop direct labor is wasted and the work must be done over. This is an average of three hundred man hours per week. It is suggested that this cost and loss of time be carefully compared with the additional work of checking this rough information and a re-appraisal made.

Because of the present shop work backlog, small amounts of time and cost that might be saved in paper work processing seem inconsequential. However, improvement of the processing of the "Request For Experimental Project Form" and associated papers seemed possible and a study was undertaken. The present system can best be explained by reference to Chart 8-2. It appears that this system has grown in a piece-meal fashion over a period of time and has become cumbersome. A complete form and system change cannot be recommended because of limitations in time, and further, would be more within the province of a business form or system specialist.

The following comments are made:

1. The present Scintilla forms do not exactly suit the need. There are two copies of the contract form (Form SC 253-Specification and Manufacturing Order Sheet) filed in the office. There is apparently no use for the extra copy. Immediately after typing the bill of material (Form SC 253-2 10 M, also called Specification and Manufacturing Order Sheet) one of them is thrown away.

EXPERIMENTAL MANUFACTURING SHOP SYSTEMS FLOW CHART — CHART 6-2



2. There are too many forms and different size papers being originated. The 2-5 by 7 loose leaf sheets, 6-8 by 10 sheets, 5 by 7 card and 3 by 5 card all contain essentially the same information. A review of requirements in the different areas and a pooling of information might allow use of just one format.

3. Approximately one-half to one day is lost in getting the approval of the Director of Engineering. It is noted that the designs behind these requests have already passed through some responsible screenings, and are well established needs. It is also noted that the Director sometimes asks questions but always signs. Couldn't, therefore, authority be delegated so that the action can start immediately with the receipt of a request form, and the Director be advised by copy of the contract immediately after preparation.

Whatever the remedy, it is considered that reduction of the backlog of work is vital to the orderly and expeditious flow of design and even production information. This would appear to be the first step in correcting the admittedly bogged-down change procedure.

8.3 Personnel.

8.31 General. The current widespread shortage of college-trained professional engineers finds no exception here at Scintilla. In fact, it was stated that the shortage of approximately 36 engineers (plus about 20 other technical people) considerably affects Scintilla's capacity to undertake new development work.

Realizing that graduate engineers will not be available in sufficient quantity in the foreseeable future, engineering administration has developed an excellent program to train designers from the Scintilla ranks. Engineering policy provides the necessary incentive to make the program effective by allowing these men to advance into engi-

neering positions after gaining sufficient proficiency and experience.

Scintilla is engaged in the Cooperative University Training Program and takes aggressive action to encourage young engineers to the division. Therefore, only one facet of the engineering personnel shortage at Scintilla needs further study - that is the matter of utilization of the present engineering force.

8.32 Engineer Utilization. It was decided to make an analysis of the activity of those professional engineers who actually operate in the main stream of engineering design activity. In order to provide a homogenous sample for the study, the following types of personnel and areas were excluded:

a. All Senior Project Engineers or higher - because their duties were liable to be more of the supervisory nature.

b. All Junior Design Engineers - because their lack of experience would not allow them to be assigned duties representative of the group to be studied.

c. All Designers, Draftsmen and Technicians - because these men cannot be classified as professional engineers.

d. All personnel of any classification who function in a service capacity such as those in one of the laboratories, field engineering or the majority under General Administration.

For the remaining 28 Project Engineers and Senior Design Engineers it would have been desirable to gather data on the various desired elements of work-activity by means of a "work sampling" technique. This technique being adaptable to statistical analysis would have allowed a percentage accuracy figure for each element of work-activity reported. However, because it is difficult to work-sample the activities of engineers without continuously interrupting their work with questions, and because not much time was available, it was decided to gather the information

by asking everyone to independently and conscientiously appraise his weekly work activity on a form distributed for this purpose.

Figures 8-4 through 8-7 present the results of this study in frequency distribution form. The diverse allocation of time to the various elements of the study and the small sample size of 28 engineers doesn't allow a smooth distribution curve. It should be noted that no attempt has been made to extrapolate the data by curve fitting. The continuous type data produced by the study has, of course, been grouped for plotting purposes; however, the averages as shown on the charts have been calculated from the raw data for greater accuracy. Chart 8-3 tabulates the all-engineering averages for the various activity elements and also allows comparison for certain selected activity-elements for each of the major design areas.

For the most part interpretation of the data will be left to management. However, it is pointed out that a very small portion of the total engineering force is devoted to actual new design work on the project engineer level. Granted, many of the other activities are necessary to the proper conduct of the project engineers' work but time spent on work progressing (3.76 hours/week), writing reports or letters by hand (2.18 hours/week), material progressing (1.90 hours/week), collecting drawings or data (1.54 hours/week) for a total of 9.38 hours per engineer per week might be studied for improvement.

8.33 Personnel Review. It is noted with some interest that a systematic employee merit rating system is not officially in use throughout engineering and indeed throughout Scintilla Division. Certain supervisors, namely those in Research and Test Laboratories have felt a need for such a system and have devised their own. A merit rating system is recommended but would be better applied on a plant-wide basis. This is being recommended separately in Chapter II of this report.

Engineering does have, however, a periodic system of wage review which does serve as an evaluation of sorts. All non-exempt personnel (except those in the Fuel Injection Design Group) are reviewed every six months under the engineering-wide co-ordination of the General Administration

# PROJECT ENGINEER WEEKLY TIME UTILIZATION

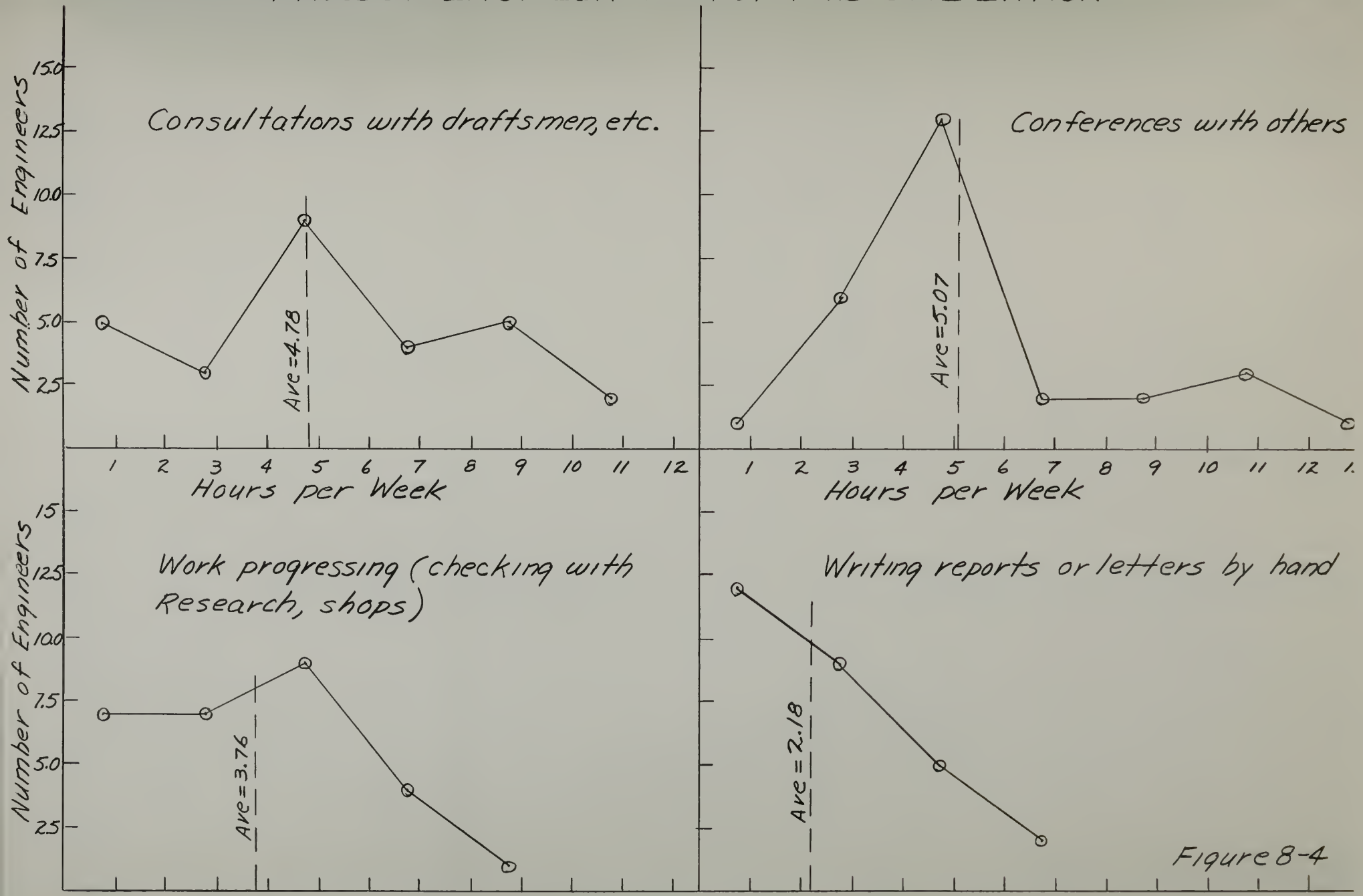



Figure 8-4

# PROJECT ENGINEER WEEKLY TIME UTILIZATION

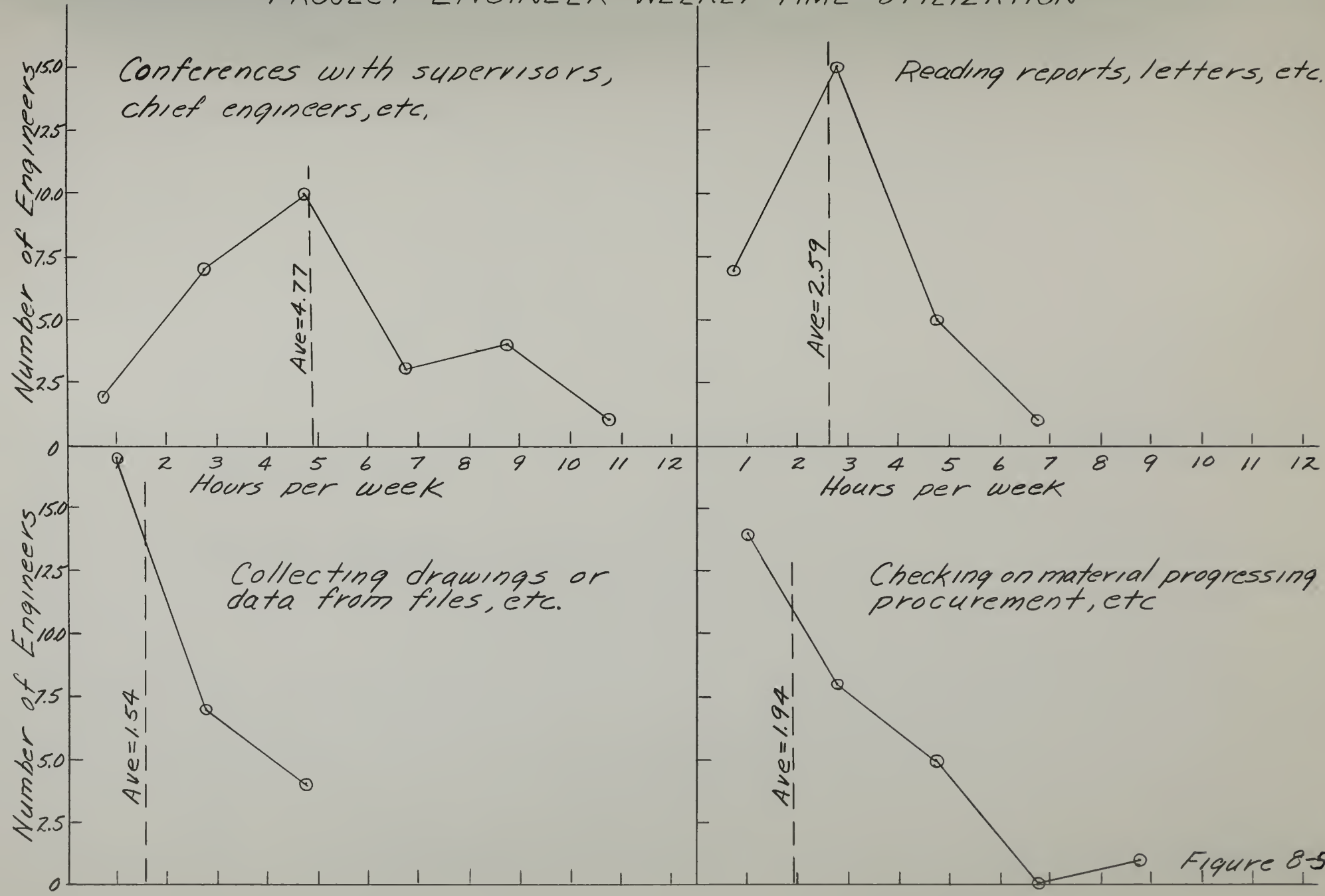



Figure 8-5

# PROJECT ENGINEER: WEEKLY TIME UTILIZATION

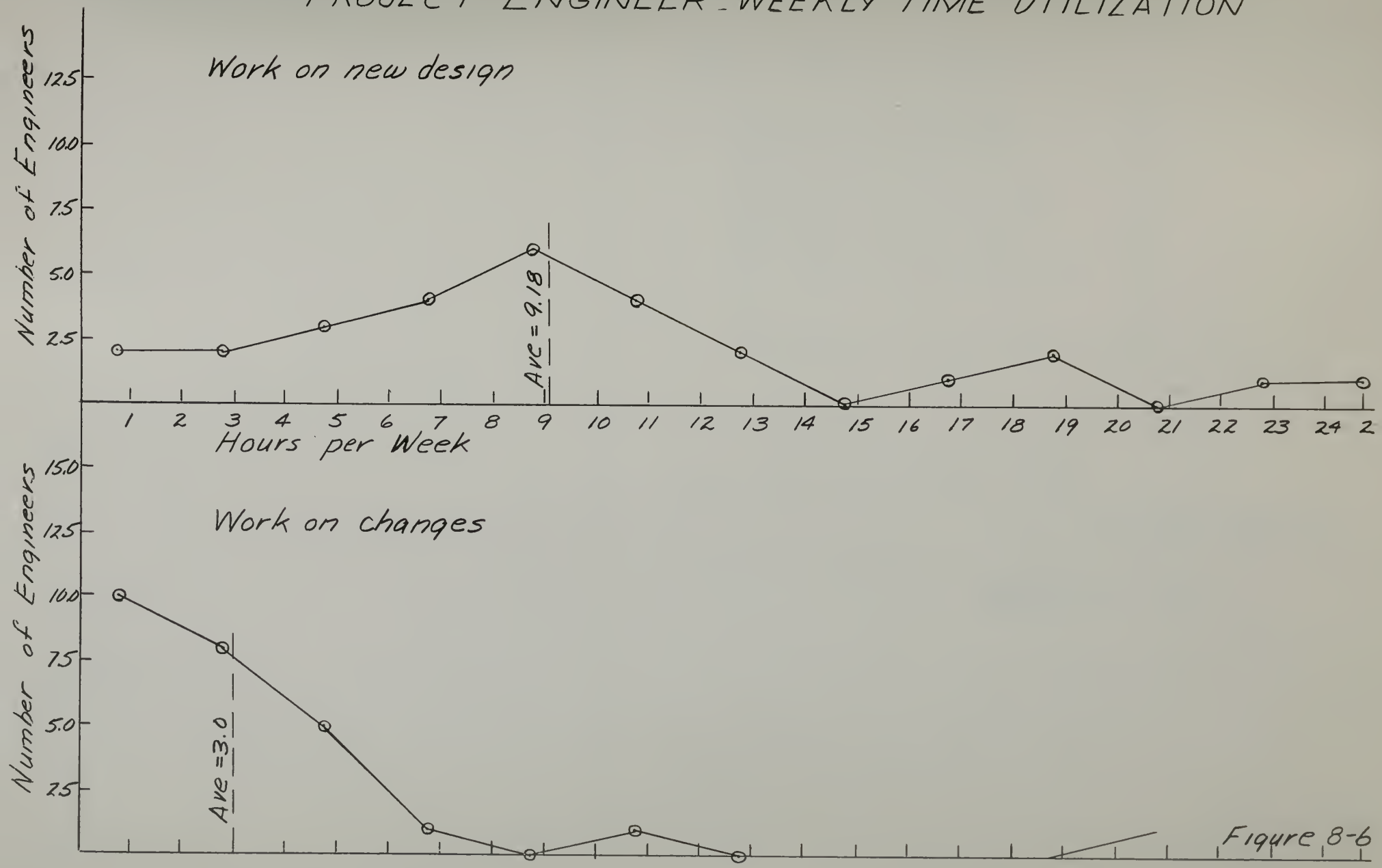
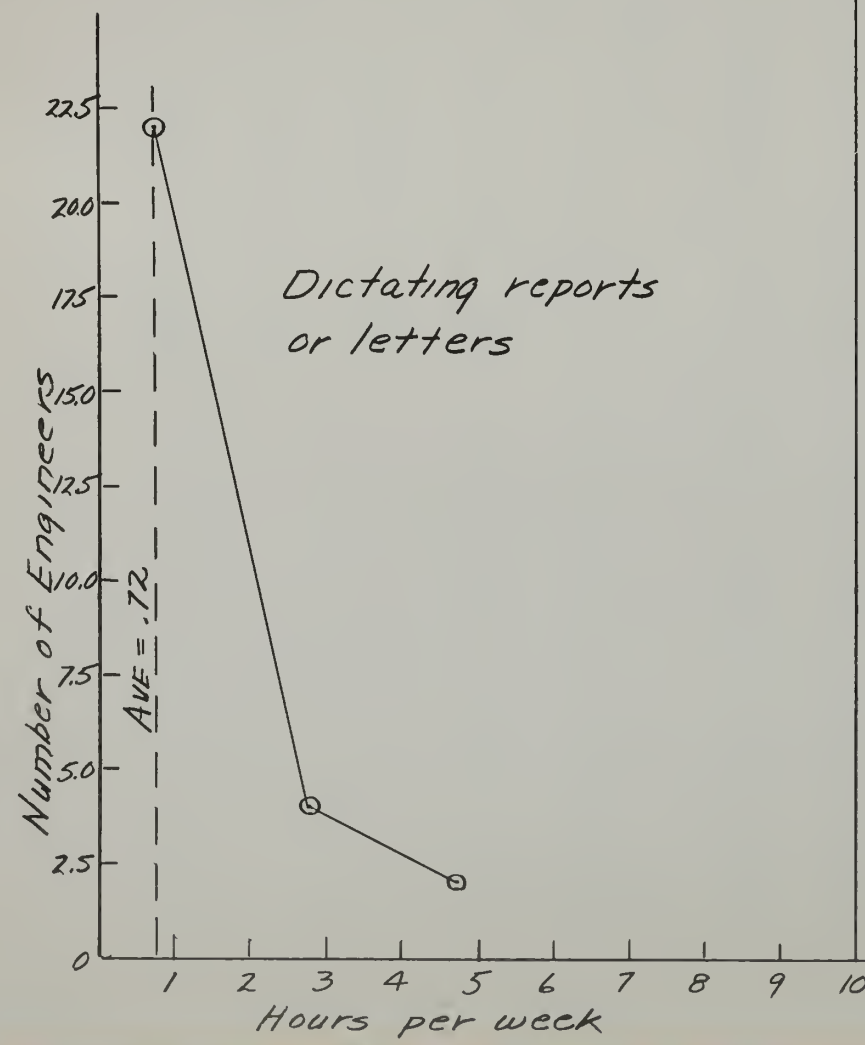



Figure 8-6

# PROJECT ENGINEER WEEKLY TIME UTILIZATION




Dictating reports or letters

Other Types of Work:

| | |
|---|---|
| Answering the phone | 1.7 |
| Developing standards | 1.5 |
| sketch and drafting | 16.0 |
| Checking customer dwgs | 2.0 |
| Checking new designs | 4.0 |
| Checking exp. hot jobs | 8.0 |
| Drafting test specs etc | 2.0 |
| Special assignments | 9.0 |
| | 2.0 |
| Teaching mathematics | 2.0 |
| | 48.2 ÷ 28 = 1.72 hrs. |

Σ of all averages = 39.53

plus other types work = 1.72

41.25 Ave hours reported (including overtime)

less ave. overtime = -1.25

40.00 per week

Figure 8-7

CHART 8-3

MMARY OF PROJECT ENGINEER WEEKLY TIME UTILIZATION

| ACTIVITY ELEMENT | WEEKLY AVERAGES - HOURS | | | | |
|---|---|---|---|---|---|
| | ALL ENGINEERING SECTIONS | FUEL INJECTION SECTION | JET SECTION (10 hrs overtime/wk) | RECIPROCATING SECTION (9 hrs overtime/wk) | CONNECTOR SECTION (9 hrs overtime/wk) |
| Conferences with supervisors, Ch. Engineers, etc. | 4.77 | 3.88 | 3.25 | 7.50 | 5.67 |
| Reading reports, letters, etc. | 2.59 | 2.88 | 2.04 | 2.69 | 4.33 |
| Collecting drawings or data from files | 1.54 | 3.37 | 1.58 | .81 | .75 |
| Checking on material progressing, procurement | 1.94 | 1.23 | 2.46 | 2.06 | .66 |
| Consultations with draftsmen | 4.78 | 3.69 | 4.25 | 4.71 | 6.67 |
| Conferences with others | 5.07 | 4.60 | 4.75 | 5.12 | 6.34 |
| Work on new design | 9.18 | 10.50 | 9.67 | 8.10 | 7.00 |
| Work on changes | 3.00 | 4.25 | 3.16 | 1.81 | 4.67 |
| Work progressing | 3.76 | 2.17 | 4.00 | 4.56 | 3.66 |
| Writing reports or letters by hand | 2.18 | | | | |
| Dictating reports or letters | .72 | | | | |
| Total | 39.53 | | | | |

Head. He confers with all interested parties and tries to get at least a three-man opinion on each ratee. It is considered that such engineering-wide monitoring of individual non-exempt wage increase recommendations provides a fair and equitable base for increase. If the system is to continue it should be extended to include all such personnel.

Exempt personnel (men on the professional engineer level) are reviewed once a year for merit increases. Reviews and recommendations are made via the organizational chain of command and are carefully monitored by top engineering management.

8.4 Work Progress and Control. Work progressing starts when the project engineer undertakes a new design job (theoretically as the result of an Engineering Project Request). The engineer makes out a rough Job Form which is sent to Job Progress Unit. Each new job is identified by an organizational or type-product coded letter prefix followed by a number assigned in numerical sequence. A Job Card is typed and filed by Job Progress with copies sent to the production liaison man on the drafting room floor and to the project engineer. A weekly list of all new jobs is sent to the Director.

The job of pushing the work through the various stages actually falls to the project engineers. The Job Progress Unit merely records the dates that the job goes into experimental shop, is finished by experimental shop, is sent to production comment and is released to production. In fact, there is no place on the Job Card for an estimated completion date.

One report made to engineering management is by a large wall board utilizing a color scheme which shows the stage of progress but with no consideration of time element. The following color code is used:

Red - in design drafting or checking

Blue - in Experimental Shop

Yellow - Experimental stage complete
In test or awaiting release

Black - Job is dormant (shows black
on board if no other color)

Green - Drawings are in for production comment

White - Drawings are released to production

The only other report seen by management in this regard is the weekly IBM tabulation of time accumulated against the various jobs in design and drafting. To be able to gain any useable information from this report, management either must be completely familiar with the time estimates for each of the approximately 350 jobs or must actively seek the estimated quantities and compare them. It is suggested that this type of cost accounting report might be more worthwhile to management if it were set up on the exception principle - that is - no news is good news. Perhaps a report could be made to management only when the job man hours and accordingly costs, are significantly at variance with the originally approved estimate. This report could be made when total costs exceed the estimate or could be refined even more by providing a series of cost check points during the life of the design. Both the estimated time and the time actually accrued could be included. This type of report would be much easier to interpret by management. In fact, there is reason to believe that the project engineers would appreciate this information.

The time progress of many jobs seems unusually slow. A sample of the Job Card File showed many jobs with estimates of less than 100 man hours for design that are over one year old. Perhaps the appropriateness of these jobs should be reviewed.

As mentioned in various sections, the man who actually does the scheduling of work through engineering is the project engineer. He thus must make his own arrangements with the Experimental Shop and the Test, Research, and Material Laboratory. Effective schedule planning on the design seems to run into trouble because a production order for a particular design is sometimes received by Sales before the design is tested or the drawings are all completed. This situation is held to be one of the major difficulties with the engineering change problem because in the rush to get into production many desirable changes (as a result of late Test Laboratory reports and production comment) have to be left behind and accomplished only through the long formal

change procedure. The answer would appear to be more effective progressing and work load control through the design and prototype stages and possibly better Engineering Department co-ordination with Sales so that any advance word on orders would be fitted immediately into the complete engineering work progressing picture.

As it stands now, the Job Progressing Unit isn't consulted when a production order is being set up through the co-ordinative efforts of Sales and PEC. The Record Section hears of the impending order and directly contacts the project engineer to establish liaison in order to accumulate all of the technical data required. It appears that an overall job progressing responsibility in one unit might be an improvement. This unit would have to be given broader correlative powers both inside and outside engineering. Especially important seems to be the necessity of obtaining more advanced data from Sales on whether certain orders are expected and using this information to shift priorities earlier in the design drafting stages. This should be accomplished not from the viewpoint of any individual project engineer but from the viewpoint of someone concerned with the overall priority situation.

8.5 Systems. An attempt to follow the main course of engineering activity and procedures is represented on Chart 8-4. This chart picks up the initial preparation of sketches and drawings and traces all the action through to the point of release to production.

The following comments are made:

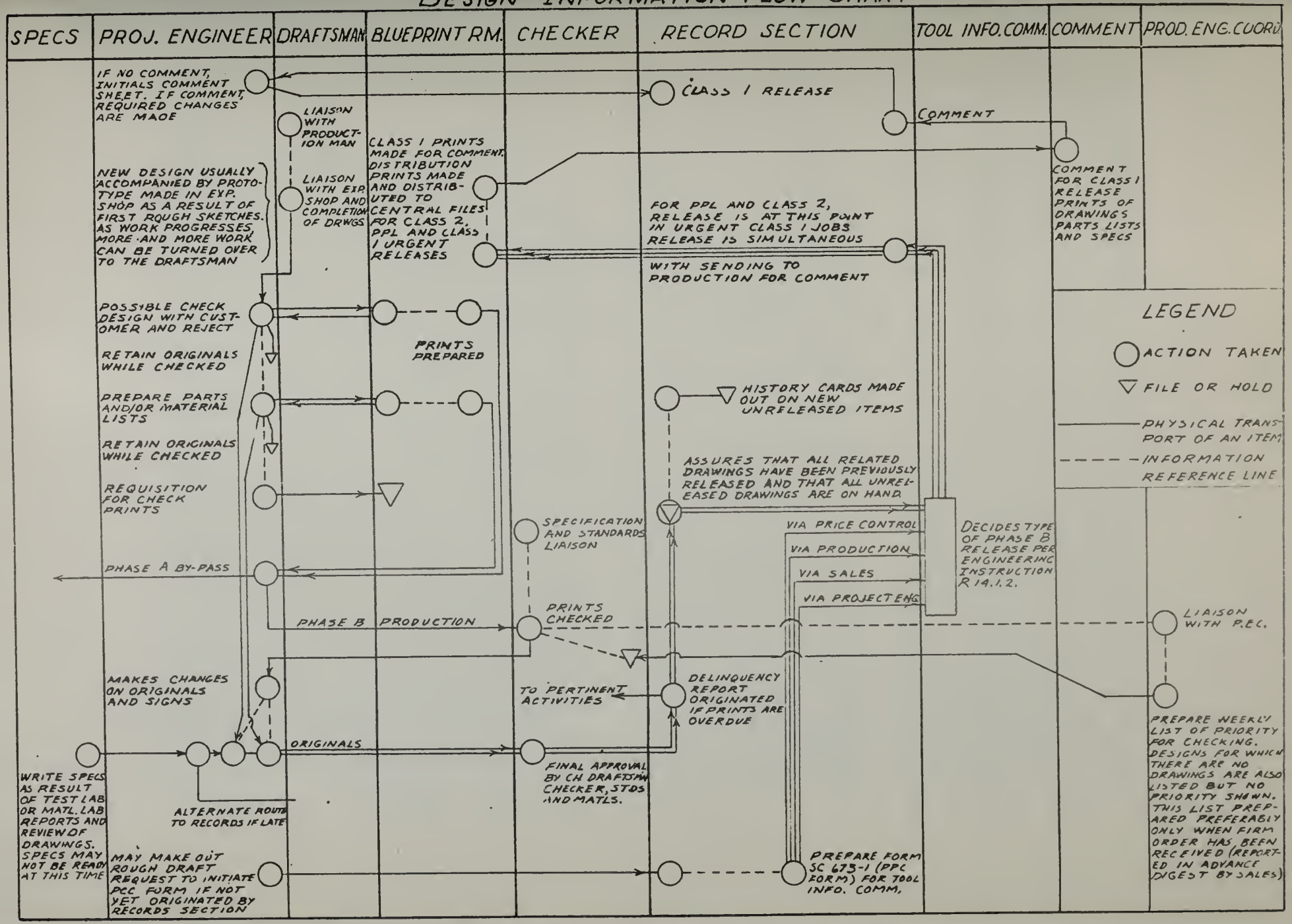
a. The chart reveals the dominant position of the project engineer in guiding his projects through the design-drafting phases.

b. Also illustrated is the fact that the Records Section serves a major work progressing function. This is so in spite of the fact that Records Section has no interest with the progressing of work until the drawings are required.

Further discussion of work progressing is included in Section 8.4.

# DESIGN INFORMATION FLOW CHART

CHART 8-4


SPECS
PROJ. ENGINEER
DRAFTSMAN
BLUEPRINT RM.
CHECKER
RECORD SECTION
TOOL INFO. COMM.
COMMENT
PROD. ENG. COORD.
IF NO COMMENT, INITIALS COMMENT SHEET. IF COMMENT, REQUIRED CHANGES ARE MADE
CLASS 1 RELEASE
COMMENT
LIAISON WITH PRODUCTION MAN
CLASS 1 PRINTS MADE FOR COMMENT. DISTRIBUTION PRINTS MADE AND DISTRIBUTED TO CENTRAL FILES FOR CLASS 2, PPL AND CLASS 1 URGENT RELEASES
COMMENT FOR CLASS 1 RELEASE PRINTS OF DRAWINGS PARTS LISTS AND SPECS
NEW DESIGN USUALLY ACCOMPANIED BY PROTOTYPE MADE IN EXP. SHOP AS A RESULT OF FIRST ROUGH SKETCHES. AS WORK PROGRESSES, MORE AND MORE WORK CAN BE TURNED OVER TO THE DRAFTSMAN
LIAISON WITH EXP. SHOP AND COMPLETION OF DRWGS.
FOR PPL AND CLASS 2, RELEASE IS AT THIS POINT IN URGENT CLASS 1 JOBS RELEASE IS SIMULTANEOUS
WITH SENDING TO PRODUCTION FOR COMMENT
POSSIBLE CHECK DESIGN WITH CUSTOMER AND REJECT
PRINTS PREPARED
RETAIN ORIGINALS WHILE CHECKED
HISTORY CARDS MADE OUT ON NEW UNRELEASED ITEMS
PREPARE PARTS AND/OR MATERIAL LISTS
RETAIN ORIGINALS WHILE CHECKED
ASSURES THAT ALL RELATED DRAWINGS HAVE BEEN PREVIOUSLY RELEASED AND THAT ALL UNRELEASED DRAWINGS ARE ON HAND
REQUISITION FOR CHECK PRINTS
SPECIFICATION AND STANDARDS LIAISON
VIA PRICE CONTROL
VIA PRODUCTION
VIA SALES
VIA PROJECT ENG.
DECIDES TYPE OF PHASE B RELEASE PER ENGINEERING INSTRUCTION R 14.1.2.
PHASE A BY-PASS
PRINTS CHECKED
PHASE B PRODUCTION
LIAISON WITH P.E.C.
MAKES CHANGES ON ORIGINALS AND SIGNS
TO PERTINENT ACTIVITIES
DELINQUENCY REPORT ORIGINATED IF PRINTS ARE OVERDUE
PREPARE WEEKLY LIST OF PRIORITY FOR CHECKING. DESIGNS FOR WHICH THERE ARE NO DRAWINGS ARE ALSO LISTED BUT NO PRIORITY SHOWN. THIS LIST PREPARED PREFERABLY ONLY WHEN FIRM ORDER HAS BEEN RECEIVED (REPORTED IN ADVANCE DIGEST BY SALES)
ORIGINALS
FINAL APPROVAL BY CH DRAFTSMAN CHECKER, STDS AND MATLS.
WRITE SPECS AS RESULT OF TEST LAB OR MATL. LAB REPORTS AND REVIEW OF DRAWINGS. SPECS MAY NOT BE READY AT THIS TIME
ALTERNATE ROUTE TO RECORDS IF LATE
MAY MAKE OUT ROUGH DRAFT REQUEST TO INITIATE PCC FORM IF NOT YET ORIGINATED BY RECORDS SECTION
PREPARE FORM SC 673-1 (PPC FORM) FOR TOOL INFO. COMM.
LEGEND
ACTION TAKEN
FILE OR HOLD
PHYSICAL TRANSPORT OF AN ITEM
INFORMATION REFERENCE LINE

8.6 Standardization. There is a small element of the Administration Section devoted to the establishment of design standards, but by virtue of its organizational position, exterior to the design sections, it appears to be regarded as an external control, rather than as an integral part of the design stage. The proposed organization of the Engineering Department would modify this condition to the extent that the Standards Unit would be placed within the Design Group under the Assistant Director for Design, as indicated in Chapter 1. Such a shift is envisioned as providing it with greater authority within the Design Group to co-ordinate standard practices.

The need for increasing the status and authority of the Standards Unit is emphasized by the present concept of standardization by the various design sections. Under the existing organization, there appear as many standardization programs being carried on individually by sections as there are sections. An example of this is observed by referencing the informal manuals of standard design components maintained by the Jet and Diesel Sections. Hence, there appears to be a need for the co-ordination of the design standards of one section with another, so that uniformity may be established and one section may have access to the standard designs of another.

Although requiring additional authority to co-ordinate design standards throughout the Engineering Department, the Standards Unit has made notable contributions in certain areas. For the most part, these areas include phases of activity which are antecedent to the basic designing stage, and relate more directly to the drafting stage. Tabulated drawings for many basic items, such as washers and screws have been produced into the Engineering Standards Manual after thorough analytic surveys into the needs of the various design sections. Such drawings are extremely valuable not only in promoting the utilization of these standard sizes and designs, but also, related prints show which of the standard sizes have previously been released and hence are already in stock. This unit has also made effective contributions toward the establishing and maintaining of drafting and tolerance standards which are also incorporated in the Engineering Standards Manual. The provision for these and other concrete aspects of standardization are recognized as effectively breaking the ground for the establishment of a more widespread program. However, the effective expansion of the standardization program appears

to hinge on increasing the size, status and authority of this unit.

Standardization sometimes requires attention to small details, some of which can be the source of rather important difficulties. An example can be drawn from the Engineering Standards Manual. Included in the B25 series instructions are standard dimensions for various condenser papers. The following observations are made:

a. The thickness of material is Dimension A in Instructions B25.1.1, B25.2.1, B25.3.1 and B25.4.1; but it is Dimension B in Instruction B25.4.3 and Dimension C in Instruction B25.5.1.

b. The part number suffix, which is the width, is Dimension B in all the above instructions except Instructions B25.4.3 and B25.5.1 where it becomes Dimension A.

c. On the various above instructions, any one suffix number does not represent any particular dimension. For example: suffix " -1 " represents ".300 in B25.1.1, ".500 in B25.4.3, ".250 in B25.5.1 and ".375 in all of the remaining three listed instructions.

d. The situation in sub-paragraph c, above, does not seem to be the result of different width requirements for the various materials. For example, a ".2625 width is used for all of the above materials but has the following different suffix designations: -38, -37, -34, -39.

It would appear that standard dimensioning and nomenclature would be most highly desirable and easily accomplished.

One phase of design standardization which appears to need emphasis is the present parts list system. Presently, the design sections must rely on unofficial records and previous parts lists when referencing previous designs. Complete and ready access to previous designs and segments of designs does not appear to be easily available to the

project engineers, and there appears to be no cross referencing between designs of different sections. Grouped Parts Lists, as tabulated by the Records Section, are used to considerable advantage to the extent that they apply to certain major components. However, they are not applicable to all previous designs nor do they provide a ready access of previously designed parts according to function. The need is recognized for a system of tabulation that will catalog previously designed parts according to function, rather than by assemblies. Such a tabulation would tend to eliminate any design duplication and would reduce unnecessary deviations from standard designs. In this regard, the Bendix part numbering system, due to its inherent inadequacies to act as a classification system in grouping like parts and designs, is a deterrent to such a program.

The need for a system of better tabulating previous designs, and for reviewing the present method of classifying them is accentuated by the rapid expansion on the Connector Section, as previously discussed in Section 8.22. This group is not considered uniquely different from the other design sections regarding the basic need for increased standardization through an improved system of classification and tabulations of previous designs as mentioned. However, the need for a long-range planning program appears more urgent in this section, and it will be considered at greater length.

The Bendix part numbering system, as previously mentioned, is not designed to act as a classification system, although it is used as such in certain cases in the connector program. It is primarily a sequential system, the digits for any particular part number representing specific connector dimensions or specifications only to a very limited degree. Due to its inherent inadequacies in classifying new connector series which have been, and are being, developed rapidly, various classification systems have sprung into existence to meet the customer requirements for an adequate means of classification. As a consequence, although each connector is designated by a Bendix part number, for the most part it is referred to in the field by another number, in accordance with the classification system to which it has been assigned.

It appears that the variety of classification systems used for series of connectors, which in many cases have more similarities than differences, tends to enhance non-standardized practices in the design stage. Hence, many similar dimensions and design features which exist between

the various series are obscurred because of the non-similar nature of their classification numbers and the physical separation of the various series in catalogs. If such emphasis on product variety and differences are considered desirable features by customers, the wide variety of series and means of classifying series may be justified. It is felt, however, that any de-emphasis on similarities be avoided by the Divisional activities which design and produce the connectors.

In order to study the degree of similarity between various series of connectors, a tabulation similar to Chart 8-6 was made for shell sizes 8S, 10S, 10SL, 12S, 12 and 14S and was made for all series contained in Catalog 12-000-S. This tabulation brought together each dimension "set" from the various series represented, grouping them according to shell size and type connector (Wall Mount Receptacle, Straight Plug, etc.). Chart 8-6 shows only a portion of this tabulation, for shell sizes 8S, 10S and 10SL only. The results of the tabulation were as follows:

a. Total number of dimensions tabulated: 690

   Total number of identical dimensions: 308 (number of dimensions identical to the AN dimension set for each shell size; this set was listed first on the expanded version of Chart 8-6 for each shell size and identical dimensions for other dimension sets were indicated by dashes)

   Percentage of identical dimensions: 44.7%

b. Total number of toleranced dimensions: 81 (Dimensions K,L,M,etc.)

   Total number of toleranced dimensions with overlapping tolerances: 24

   Percentage of dimensions with overlapping tolerances: 28.4%

The above figures are significant only with respect to the fact that a tabulation such as utilized is valuable in pointing out similarities between designs. Although the overlapping tolerances may be justified, the tabulation is helpful for recognizing that such overlap exists, and might

provide a basis for evaluating the degree to which differences in tolerances and dimensions are justified. In addition, a tabulation system whereby the elements of the various series are considered together, if established and kept current, would serve as a valuable deterrent for deviating from previously established dimensions and designs. Hence, it would provide a powerful tool for increased standardization in the connector program.

A degree of non-standardization practice in dimensioning, as previously noted in condenser papers, was also noted in the tabulated connector drawings. For example, Dimension L in the RB 3100 Wall-Mounting Receptacle refers to a different characteristic dimension than Dimension L in the AN 3100 Wall-Mounting Receptacle. This type of inconsistency, which leads to additional emphasis on differences rather than similarities, is recognized as a natural by-product of the departure from standardized practice by the many similar series and classification means which have been developed.

Chart 8-5 is presented as a possible means by which all present connector series might be contained in one classification system. This system would utilize a tabulation such as shown in Chart 8-6 which reduces all series to one tabulation. It is felt that a more detailed investigation should be conducted to appraise the possibility of a classification system which would not only replace the present Bendix part numbering system, but also standardize the classification of existing and future series.

The present IBM equipment presents serious restrictions to the adoption of a universal classification system such as that of Chart 8-5, partly due to its limited capacity to accept letter digits. This and other limitations of existing equipment suggests the need for a thorough evaluation of present and future requirements leading to the conversion or replacement of present equipment. Such conversion or replacement appears inevitable, but it should follow only after a long-range program has been established, based upon the optimum incorporation of standardization principles.

CHART 8-5

CLASSIFICATION SYSTEM EVALUATION

All connectors would be classified in accordance with the following eleven-digit classification system:

X X - X X X X X X - X X X

1st DIGIT: Receptacle or Plug Type

1 - Wall Mounting Receptacle
2 - Cable Connecting Receptacle
3 - Box Mounting Receptacle
4 - Straight Plug
5 - 90 Degree Plug

2nd DIGIT: General Description

1 - Solid Shell (A)
2 - Split Shell (B)
3 - Pressurized (C)
4 - Sealed (D)
5 - Environmental Resisting (E)
6 - Fireproof (F)
etc.

3rd DIGIT: Shell Size

A - 8S
B - 10S
C - 10SL
D - 12S
E - 12
F - 14S
G - 14
etc.

4th DIGIT: Type Contact

1 - Solder type pin
2 - Solder type socket
3 - Solderless (Crimp) type pin
4 - Solderless (Crimp) type socket
5 - Thermocouple type pin
6 - Thermocouple type socket
etc.

5th and 6th DIGITS: Insert Arrangement, contact size and characteristics for each shell size

1 - (Insert arrangements for each
2 - shell size as tabulated on Pg.
3 - 7-C of Catalog 12-000-S, with
4 - additional columns tabulated
etc. to show AN Service Rating and Voltage Ratings.)

7th DIGIT: Dimensions per Shell Size

A - (Denotes one "set" of
B - dimensions (B, K, L, M,
C - etc.) for a particular
etc. shell size, each set representing all the dimensions for a particular shell size under the present AN, CB, RB, W, etc. Series. This would entail the establishment of a "super-tabulation", as shown in part in Chart 8-6 combining all the present series by type receptacle or plug and shell size. Chart 8-6 is not complete for the shell sizes covered, as additional dimension "sets" should be added for Series that are not represented.

8th DIGIT: Contact Material

1 - Chromel
2 - Alumel
3 - Iron
4 - Constantan
etc.

9th DIGIT: Insert Rotated

1 - W (Pg. 62-C of Catalog
2 - X 12-000-S contains a
3 - Y tabulation of these
4 - Z specifications.)

10th and 11th DIGITS: Unassigned but available for designating further specifications, as insert material, plating, etc; or for accessories (gaskets, grommets, etc.) which would automatically conform to the tabulated dimensions specified by DIGIT 7.

Note: Dash (—) denotes identical to first entry of given size

| SHELL SIZE | SET | A-THREAD | J | B | C | K | L | M | N | Q | R | S | T | U | V-THREAD | W | X | Y | Z | TYPE | PRESENT SERIES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8S | A | .5000-.28NEF-2 | | .391 | | .672 | 1.391 | .562 | .532 | | .594 | .875 | .120 | | .5000-28NEF-2 | | .141 | | .472 | Wall Mount Receptacle (A-C) | AN |
| | B | — | | — | | — | .979 | — | | | | — | — | | .3750-32NEF-2 | | — | | — | " | CB |
| | C | — | | — | | — | .979 | — | .375 | | | — | — | | | | — | | — | Box Mount Receptacle (A-C) | AN |
| | D | — | | .406 | | | 1.390 | | — | | | | | | — | | | | 1.134 | Cable Connect. Recept. (A-C) | AN |
| | E | — | | .396 | | | .979 | | .500 | | | | | | .3750-32NEF-2 | | | | 1.134 | " | CB |
| | | | | | | | | | | | | | | | | | | | | | |
| 10S | A | .6250-24NEF-2 | | .391 | | .672 | 1.468 | .563 | .628 | | .719 | 1.000 | .120 | | .5000-28NEF-2 | | .141 | | .472 | Wall Mount Recept. (A-C) | AN |
| | B | — | | — | | — | .979 | — | | | — | — | — | | — | | — | | — | " | CB |
| | C | — | | — | | .704 | 1.104 | .562 | | | — | — | .150 | | — | | | .364 | .450 | " | RB |
| | D | — | | — | | — | .979 | .562 | .500 | | — | — | — | | | | — | | — | Box Mount Recept. (A-C) | AN |
| | E | — | | — | | .703 | .984 | .562 | | | — | — | .150 | | | | .490 | .469 | .446 | " | RB |
| | F | — | | — | | .703 | .984 | .562 | .469 | | — | — | .150 | | | | | | .446 | " | W |
| | G | — | | .406 | | | 1.468 | | .628 | | | | | | — | | | | 1.134 | Cable Connect. Recept. (A-C) | AN |
| | H | — | | .396 | | | .979 | | .625 | | | | | | — | | | | 1.134 | " | CB |
| | J | — | | | 1.000 | .719 | 1.119 | .453 | | | | .750 | | | — | | .490 | .364 | .450 | " | RB |
| | K | — | .531 | | | | .859 | | | .885 | | | | | — | | | | .607 | Straight Plug (A-C) | AN |
| | L | — | — | | | | .984 | | | — | | | | | — | | | | — | " | CB |
| | M | — | .516 | | | | .578 | | | .866 | | | | .047 | — | | .490 | .364 | .618 | " | RB |
| | N | — | — | | | | .563 | | | .819 | | | | | — | .672 | .407 | .083 | .603 | " | W |
| | | | | | | | | | | | | | | | | | | | | | |
| 10SL | A | .6250-24NEF-2 | | .391 | | .672 | 1.468 | .562 | .755 | | .719 | 1.000 | .12 | | .6250-24NEF-2 | | | | .472 | Wall Mount Recept. (A-C) | AN |
| | B | — | | — | | — | .979 | — | | | — | — | — | | — | | | | — | " | CB |
| | C | — | | — | | — | .969 | — | .625 | | — | — | — | | | | | | — | Box Mount Recept. (A-C) | AN |
| | D | — | | — | | — | — | — | .625 | | .625 | .812 | — | | | | | | .467 | " | CF |
| | E | — | | — | | | — | | — | | | | | | — | | | | 1.134 | Cable Connect Recept. (A-C) | AN |
| | F | — | | | | | .979 | | .625 | | | | | | | | | | 1.134 | " | CB |
| | G | — | .553 | | | | .957 | | | .885 | | | | | — | | | | .607 | Straight Plug (A-C) | AN |
| | H | — | — | | | | 1.01 | | | | | | | | — | | | | — | " | CB |

8.71 Material Review Board (MRB).

Production Inspection Engineering Board (PIE).

Corrective Action Meeting. The MRB exists as a sort of super quality control over work that has already been rejected. Engineering full time representation on this board is considered an excellent way to meet the manufacturing problems that are bound to occur. The board can vote to accept any lot of rejected material or units but only by unanimous vote. Therefore, Engineering, by exercising a veto, can remain in firm control of quality standards. The direct daily informal liaison with appropriate engineering personnel thus afforded by means of the engineering representative serves to accomplish needed action rapidly.

As a follow-up on the work of the MRB, the PIE Board meets weekly under the guidance of the Assistant Quality Control Manager. The agenda is made up informally of items disclosed by the work of the MRB or from any other source. The board's main function is to study changes in manufacturing methods or to ease requirements or tolerances. After the board agrees that action is needed, that particular problem is included in the minutes. This procedure seems to assure a top-level and well-considered analysis prior to the problem being directed to Engineering for action.

The Corrective Action Board functions mostly by reviewing lots of repeatedly rejected material to determine if it can be salvaged. This board is of a more formal nature. A formal agenda is prepared when similar items are rejected five or more times by the MRB. This board, it would appear, is of benefit to engineering as long as it is not used as a means of getting Engineering to yield to pressure to relax quality standards or to pass sub-standard lots. This is evidently not the case.

There seem to be no written instructions on the objectives or functions of either the MRB or PIE Board.

8.72 Production Liaison. Production maintains continuous liaison with engineering designs by assigning an experienced production man to engineering on a full-time basis. He is provided a desk directly adjacent to the drafting area and is provided a copy of the Job Form made out on most new engineering projects. From here on he seems to be on his own. There is no set procedure whereby he can at least see all the work in process. The volume of work is such that he feels unable to review everything as carefully as originally intended even if a firm procedure were in effect.

His work is strictly of a suggestive nature and may be accepted or rejected by engineering personnel. However, it seems that in many instances his advice is not solicited. A reluctance on the part of an engineer to seek producibility advice is understandable but cannot be completely condoned. It is no reflection on Scintilla's engineers when it is stated that engineers are often not as production-oriented as they should be.

It is felt that a strengthening of the production liaison function would be of benefit. A change in the formal production comment process used for class 1 production releases is not implied. However, careful attention to design producibility during all design stages could provide cheaper and faster production processing. Further, it would probably reduce the number of engineering changes resulting from the production comment process and as a result of manufacturing experience.

8.73 Co-ordination With The Service Department. There appears to be no formal liaison with the Service Department during the project design stage. Presently, after a design has been completed and the prints released to Production, the Service Department finds it necessary to provide for product alterations in order to furnish the desired degree of serviceability in the field. Hence, although military specifications are followed with regard to the degree of serviceability that should be allowed, increased attention might be paid in the design stage to the requirements of the Service Department. The provision for a Service Liaison Representative in the Engineering Department, with duties which parallel the intended function of the Production Liaison Representative, might provide the needed co-ordination. In addition, this representative might act as an agency for the gathering and relaying of information to the Service

Department relative to their preparation of Service Instructions, to insure their earlier completion.

The Engineering-Service Meeting serves at present as the principal formally-established link between the two Departments. The agenda for these meetings concerns customer field testing of production items, proposed engineering action to correct product deficiencies in the field, and other items of mutual interest. However, the meeting does not serve as a source of communications for pending engineering action on changes or new products. Thus, there appears to be a need for establishing a system to provide increased communications with the Service Department in order to keep them and their Field Representatives abreast of all pertinent current engineering developments.

These requirements are further discussed in Chapter IX.

8.8 Recommendations. It is recommended that:

1. The present position of Assistant Director of Engineering be re-designated as the Assistant Director for Design. (8.21, 8.22, 8.24)

2. The General Administration Section be re-located organizationally to a staff position to the Director of Engineering, more commensurate with its broad co-ordinative and service responsibilities. (8.21, 8.24)

3. The Job Progressing function be consolidated and strengthened so as to more effectively co-ordinate the timely progressing of designs throughout all phases of engineering. (8.21, 8.247, 8.4)

4. The Standards Unit be strengthened and re-located organizationally under the Assistant Director for Design, in order to make standards an integral part of the Design Group and to provide increased co-ordination and control of standardization in the early design stage. (8.21, 8.22, 8.246, 8.6)

5. Closer liaison be provided with the Manufacturing and Service Departments. (8.72, 8.73)

6. The present part numbering and classification

systems policy be re-evaluated in order to promote standardization, prevent unnecessary deviations from standard designs, and afford easier access to previous designs. (8.22, 8.6)

7. A long-range program be established for the increased utilization of tabulating and computer equipment. (8.242, 8.4, 8.6)

8. The Drafting Pool be relocated under the Assistant Director for Design. It should be strengthened to allow operation as a pool and as a better training ground for checkers. (8.241)

9. A systems specialist be utilized to study, improve and formalize procedures within the Engineering Department. (8.21, 8.22, 8.26)

# CHAPTER IX - SALES, SERVICE AND ADVERTISING

9.1 General Discussion. The Sales, Service and Advertising Department is headed by the Director of Sales, Service and Advertising. Each of the subordinate sections is headed by a manager -- Sales Manager, Service Manager, and Advertising Manager. Both the Sales Manager and the Service Manager have Assistant Managers, while the Sales Manager has, in addition, an Assistant to the Sales Manager assigned. The Assistant to the Sales Manager is charged primarily with the administration of the Sales Office which comprises all three sections.

Exclusive of these Managers and their Assistants, the personnel of the Department consists of 127 Service personnel and 167 Sales personnel. The Advertising Manager represents the only person assigned exclusively to the Advertising Section.

The general tenor of the attitudes of personnel interviewed was found to be good. To a man, they appeared dedicated to their work and to the principle that Scintilla products will outperform any other brand on the market. In addition, there was clear-cut evidence that these personnel are dedicated to the proposition that any Scintilla product sold must provide 100% reliability. While these traits are admirable, and indeed indispensable to the effort, there was a noticeable lack of smugness or satisfaction with last year's results. Those persons interviewed appeared well aware of the pressure of competition, the need for increased effort in several lines, and the requirement that Scintilla-Customer relations remain at the high plane which is now enjoyed.

In general, the department is considered to be adequately staffed by dedicated, alert personnel.

Conditions generally within the department were considered to be good. It appeared that with the completion of the building extension, some of the space now utilized by certain functions would become available to relieve the somewhat congested physical layout of the Sales, Service and Advertising Department.

9.2 Sales, General Discussion. The Sales Department functions entirely independently of the Bendix Corporation except

in the field of advertising. This connection in the field of advertising will be covered elsewhere in this report. There appears to be no dictation of policy, price, or other influence from the corporate level, thus leaving the sales personnel of Scintilla free to pursue their primary function of selling Scintilla products as their own ideas and observations dictate.

Sales to foreign customers (except Canada) are made through the Bendix International Division which is located in New York City. This Bendix division acts as a distributor for the entire line of Bendix products. Expenses of Bendix International are pro-rated among the divisions with any profits accruing being returned to the divisions on a pro-rata basis of dollar sales.

Organizationally, the Sales Department appears to have grown around expediency and when viewed in company with its counterparts in the Service and Advertising functions, there appears to be some overlap. This is particularly noticeable when noting the functions of the Trade Sales Section of the Service Department and the District Offices of the Sales Department, as well as the Service Publication Section of the Service Department and the Liaison and Public Information Section of the Sales Department. Additionally, in applying the textbook approach to the question of organization itself, the provision for both an Assistant Sales Manager and an Assistant to the Sales Manager appears to be an unwarranted luxury. Further discussion of the organizational aspects of the department is contained in other sections of this report.

In its inability to meet delivery dates in some instances, the Sales Department has been placed in the embarrassing position of having to notify customers of this inability to deliver, This appears to be the biggest single problem facing the Sales Department. While no figure was available showing the loss of business through this inability to deliver, it must be assumed that customer good-will has been taxed on many occasions. The provision for a system of central control in Production Scheduling would allow Sales a better picture of manpower and machinery loading as well as more complete cost information. The provision for such a central scheduling function would provide sales with a day-by-day picture of progress of orders. If such a schedule could be provided on a weekly basis, the integration of rush orders into the process would change only a weekly rather than a monthly schedule as is now the case.

There are recommendations similar to this in the section devoted to Manufacturing. In these recommendations, the Sales Department observer highly concurs.

The department maintains written contracts with all distributors and jobbers of the Scintilla line. Such distributors and jobbers are assigned a non-exclusive territory, generally tailored to state, county or other geographic area. Included in this contract is the stipulated price agreement in effect which prevents the undercutting of company established prices. Any violation of either the geographic or price clauses of the contract results in a revocation of the franchise. Aside from this recision of contract, no further action is usually taken by the company.

Figures presented indicated that 87% of the company business is done on governmental contracts. It is felt that perhaps this ratio may tend to make the company too dependent upon government work to remain wholly competitive should a government cutback be encountered. While the reasons elicited for this preponderance of government orders are considered sound, it is suggested that the predicted growth of the connector line offers an ideal opening for reducing this ratio.

The Company has made studies relative to the cost of processing an order through the Sales Department. The last such study was made about five years ago when the figure was set at $5.00. A check has been maintained on this figure with the result that it has now been arbitrarily raised to $6.50. It is felt that with the movement of the connector section to the new building, an excellent opportunity to re-study this figure will be presented, and that such a re-study be made is suggested.

The Sales Department maintains personnel records on all employees. The merit ratings of the personnel are reviewed monthly with points assigned at 0,2,4 or 6 on merit and one-half point per month for longevity. These assignments are made monthly by the Assistant to the Sales Manager and the Product Manager of the person involved. The record of these assignments are maintained in Sales until separation of the person from the Sales organization. At that time a summary is compiled and sent to Personnel for inclusion in the subject's personnel record. Any report such as the completion of a training course is submitted to Personnel immediately for inclusion in the person's record. In the assignment of merit rating, the score of 2 is considered

average, thus allowing for one degree of below average performance and two degrees of excellence.

The Sales Budget is assigned by the Accounting Department, and is usually 3 to 3½% percent of sales in the previous year. The Sales Department has no part in preparing the overall company budget.

9.20 Electrical Connectors. The production of electrical connectors was an outgrowth of a Scintilla search for a specific connector embracing specified heat and altitude properties. In seeking this connector, Scintilla finally manufactured some of its own for limited application to contracts. These prototype models were so well received that ultimately the company went into production on these items. This act was followed by a mushrooming of sales and variety of connectors produced.

At the present this line of products appears to be the most potentially lucrative of the product line. Figures projected through the next five years indicate an expected increase in sales of connectors which will rise from 17.4% of sales revenue in fiscal 1956 to a high of 37.6% in 1961. This anticipated increase in connector output has triggered a plant expansion program which will extend into 1960. The projected sales figure for these products indicate that it is in this area that the hopes for future increases in sales primarily lies.

To process the connector orders through the Connector Section, there are 32 persons employed. The section is headed by a Product Manager and a Supervisor, assisted by three Application Engineers, a Specification Engineer, eleven Correspondence Expediters, and fifteen Clerks.

The mushrooming of connector sales has brought growing pains to this section, with attendant problems in the order processing routine.

In noting these problems in processing, it should be borne in mind that efforts are underway to alleviate all of them upon completion of the first phase of the factory expansion program. As a result, the connector section is being maintained in a status quo awaiting such additional space and facilities.

It is considered quite proper that at this phase of the expansion program that such status quo should be maintained. With the advent of the new facilities, the following suggestions are made for consideration and possible inclusion in the transition to the new facilities:

1. That a uniform classification of connector parts be implemented. At the present there are some 150,000 variations of the connector products carried as live products. While the MS series must be identified as the MS series on governmental orders, and the Scintilla theme of service to the customer dictates that orders be received using the customer's part number, the identification problem within the plant could be alleviated by adoption of a uniform classification covering all variations in connector products.

The sustained growth of the connector field has caused the present classification to become inadequate. With the projected growth of the connector business in the future, this problem will tend to become compounded as volume and variations increase. It is considered that the period of transition of the connector section into new facilities offers a good opportunity to re-evaluate and re-design the present classification.

2. The physical dislocation of the connector section from the main sales office upon the completion of the new facilities may introduce communication difficulties. It is necessary for such papers as shippers, IBM cards and various other forms to be moved from the main sales office to the connector section several times daily. Since the daily intra-plant mail service provides only two deliveries per day, this is wholly inadequate to meet the needs of the Sales Department. The installation of a pneumatic tube or facsimile system between the locations should be considered. It is realized that either system is costly and that pneumatic tubing provides no flexibility. The use of facsimile may present problems if it is necessary to batch IBM cards for transmission. While neither of the above suggestions is considered the ultimate answer, it is strongly recommended that thought be given to the solution of this possible communication problem well in advance of completion of the connector facilities. This is suggested in order that maximum economy of installation may be realized through inclusion in the building program, rather than as a modification upon completion.

3. Lead time in meeting connector orders is frequently critical. There seems to be something of a tendency among connector customers to think that connectors are stocked and ready for immediate delivery upon receipt of an order. This is not the case. While connector parts are stocked, and sales makes every effort to anticipate need and assemble connectors in advance, this idea that connectors are hardware items bought off shelves frequently presents the connector section with short lead time problems. As a result of this thinking in the field, connectors appear to present more than their normal quota of rush orders. In an effort to alleviate this problem, it is suggested that the Sales Representatives in the field undertake a concerted program to constantly remind customers of the critical lead time requirement relative to connectors. Again, the completion of the connector facilities is anticipated in hopes of assisting in the alleviation of this problem. However, with the continuing increase in sales pending completion of the additional facilities, the problem is such as to cause concern for meeting delivery dates at present. It is suggested that in the interim, every effort be made to ask indulgence of customers based on the principle that the bottleneck is being removed to provide better delivery time in the future.

9.21 Diesel Fuel Injection Equipment. The Diesel Fuel Injection Section of the Department is headed by a Product Manager who is assisted by a Supervisor, two Application Engineers, a Correspondence Expediter, and a Clerk.

The section processes orders received which pertain to products manufactured for application to diesel equipment. The line is devoted primarily to the fields of pumps and injection nozzles.

Sales forecasts projected through 1961 show no perceptible increase in the expected volume of sales of this line during that period. While it is considered desirable to keep the Scintilla name in the field, it appears that the market potential available is diminishing each year. It is understood that the shortage of Diesel Engineers and plant capacity has forced this status onto the company against the Sales Department's desires and their expected ability to sell increased volume.

However, based on a survey of the market completed in 1953, the picture of the potential market appears somewhat

limited. This survey showed that the following manufacturers of diesel engines manufactured their own injection equipment in the percentages of the total market indicated:

| | |
|---|---|
| Cummins | 23.5% |
| International Harvester | 14.2% |
| Caterpillar | 10.3% |
| General Motors | 8.5% |
| | 56.5% |

In addition to the 56.5% accounted for above, this survey also indicated that of the non-engine manufacturers, American Bosch had 37.9% of the remaining market. These five companies therefore accounted for 94.4% of the total market in 1953.

Subsequent to the time of this survey, the peak of the shift from steam to diesel power by railroads and from gasoline to diesel by truck fleet operators has been reached. This has resulted in the manufacture of fewer diesels during succeeding years, pointing to diminished initial installation potential yearly. In the interim, the companies mentioned above are strengthening their position in the field. Thus, it is felt reasonable to suggest that a re-appraisal of the diesel injection picture as a whole is in order. This re-survey should be instituted with a view toward the profit potential of the line based upon changes in the picture since the 1953 survey.

If such a survey indicates that potential does indeed exist, every effort should be lent toward an early expansion in this area. It is felt that with conditions as indicated being present, a delay until at least 1961 in expanding this product line could well prove fatal to hopes for subsequent years.

9.22 Industrial Products. The Industrial Products Section of the Sales Department is composed of seven persons. Heading the group is a Product Manager, assisted by an Assistant Supervisor, an Application Engineer, a Specification Engineer, a Correspondence Expediter, and two Clerks.

This section is concerned with the processing of orders covering such products as ignition systems for outboard motors, power lawn mowers, ignition for large and small industrial applications, and a limited ceramics manufacturing operation.

Figures projected through the period of fiscal 1956-1961 indicate that the expected sales of these products will provide an average of 5.8% of total sales during the period.

There appears to be a steadily growing market available for these products which are untapped because of limited manufacturing capacity. Again, Scintilla is marking time awaiting additional capacity. As mentioned in relation to the Diesel Fuel Injection line, the cost of keeping the Scintilla name in the field may possibly outweigh its ultimate gain. This is considered particularly true in view of the projected sales outlook showing no significant trend toward substantial sales increases through fiscal 1961.

9.23 Aviation Miscellaneous Products. This section is headed by a Product Manager who has five assistants, including one Application Engineer, a Specification Engineer, two Correspondence Expediters, and a Clerk.

Such items as Ignition Analyzers, Beneseal Wiring Assemblies, and harnesses for other than ignition purposes comprise the bulk of the products handled through this section.

In general with the other sections, orders are processed in a standard manner, though some slight variations are present in each of the sections. Also in common with the other production sections, there is often a pre-ordering inquiry relative to price, delivery, date, etc., or the sales department has forecast the requirement for a specified number of items for a specific delivery date.

Generally, the sales division concerned has prior knowledge of a forthcoming order, with the result that in many instances the price and delivery dates have been established, prior to actual receipt of the customer's written order.

The order procedure requires written notice except in cases where the customer's telephonic requests have been proved to be completely reliable over a period of years. On such rare occurrences, telephone orders will be processed, but it should be noted that this is by far the exception rather than the rule.

Upon receipt of a written order, the order is placed in a standard green order folder which is printed for this specific purpose. At this time the Correspondence Exoediter involved with the order assigns a customer order number, notes the customer's account number, and assigns a shipper number to the order. Upon completion of this, the price authorization request and the delivery authorization request are placed in the folder with the original order. The folder is then submitted to the Specification Engineer who institutes a Shipper Instruction Sheet which incorporates the customer marking, the customer part number involved and the Scintilla part number, as well as the latest change number pertaining to the product ordered. This Shipper Instruction Sheet is added to the contents of the folder which is returned to the Correspondence Expediter. At this time, the Expediter codes the order for Accounting and Production uses. At this time, the Expediter also enters the order on the Daily Digest, which signals Manufacturing to go ahead with production.

Upon completion of the Digest entry, the Expediter submits the complete folder to a typist who types the necessary copies of the shipper involved. One copy is returned to the Expediter for his file, one is placed in the folder, and several copies of the shipper along with the Shipper Instruction Sheets are sent to the Production Department. The number of shippers forwarded varies with the number of individual shipments involved on the shipper. Subsequent to this action, the folder is sent to the file room.

As a follow up procedure, the Shipping Department issues Daily Shipping Sheets, showing the shipments made on a particular day. The pertinent portions of this sheet are posted to the Expediter's copies of the shippers upon receipt. This serves to notify the Expediter that a particular order, or a portion of a particular order has been shipped.

This section, in common with the others, has Expediters assigned to specific customers. For instance, one expediter is assigned to an account (Pratt and Whitney, for instance) and any queries or other dealings with Pratt and Whitney relative to any of their orders is handled through this particular Expediter. This allows the customer the privilege of knowing exactly with whom he should confer when calling either in person or by telephone to check the status of an order. In the event an Expediter is absent when a call comes in, the Supervisor is qualified to fill in for any of the Expediters assigned to the section.

A standard system of noting customer queries and replies has been instituted within this section which is considered good. It consists simply of making any notes relative to an order which are intended for intra-plant use on the order folder in pencil. If any information relative to an order is imparted to a customer by telephone, the gist of such information is noted on the folder in ink. This gives an eye-catching digest of what the customer has been told relative to a particular order at each subsequent call, or upon examination of the order folder by anyone concerned.

9.24 Aircraft Engine and Burner Ignition. This section handles orders pertaining to Ignition Harnesses, Ignition Equipment and Jet Igniter Plugs.

The section is composed of a Product Manager, a Supervisor, two Application Engineers, four Specification Engineers, four Correspondence Expediters and three Clerks.

In combination with the Aviation Miscellaneous Products Section, the two sections are projected to provide 48% of sales during fiscal year 1957. This figure diminishes to an estimated 43.7% in fiscal 1961. While this may appear to indicate a slackening of business, this is not wholly the case. It is anticipated that the gradual phasing out of propeller aircraft will provide less and less dollar revenue through ensuing years. However, the onrush of jet aircraft is expected to take up some of the slack, though total dollar revenue will suffer due to the reduced price of jet igniter plugs as opposed to the aircraft magneto.

Sales predictions indicate that while military aircraft is rapidly becoming essentially a jet business, there is considerable expansion in the propeller field because of such applications as the business aircraft, the light private aircraft, and the overseas market.

Generally speaking, this section is considered to be at the mercy of fluctuations in the aircraft industry. While the foreseeable future apparently indicates continued high production of aircraft for both commercial and military uses, the loss of dollar revenue in this section could become serious. It is realized that the five-year prediction of sales indicates this loss of revenue due to the increase in jet usage, indications are that by 1961 many commercial airliners will be jet propelled.

For this reason, it is recommended that Scintilla undertake a complete study of the field no later than 1959. This study should ultimately aim at seeking out applications for Scintilla products to jet aircraft, rockets and missiles which will provide volume and revenue to this product line.

9.25 District Offices. The company maintains seven District Offices located throughout the United States. There are 27 persons employed in these offices, of whom twelve are classified as Application Engineers. Of these twelve, two are based at the home office in Sidney and are used to implement the coverage of the United States provided by the Sales Representatives headquartered in the various District Offices.

The Application Engineers based in Sidney usually make a circuit of their areas about twice per year. In addition, they are maintained for purposes of dispatching to "hot spots" or as application consultants upon request. The territory normally covered from the Sidney office covers the Northeastern United States area, generally encompassing northern New York, New Hampshire, Vermont, Maine, Massachusetts, Connecticut and Rhode Island.

The largest of the District Offices is located in Burbank, California. The Burbank office is quartered as a part of the Bendix West Coast organization. The pooling of Scintilla personnel with other Bendix Division personnel stationed at Burbank gives not only Scintilla, but the entire Bendix organization a complete corporate organization representation in the West Coast area.

Scintilla's West Coast Sales Manager is located in the Burbank office. The West Coast Sales Manager is directly responsible to the Bendix West Coast Service Manager, and is assisted by one Supervisor, three Application Engineers, two Correspondence Expediters, a Secretary and five Clerks.

The Burbank office is located so as to provide complete representation to the concentrated aircraft industry of Southern California and the Pacific Northwest. These representatives, while concentrating on the aviation industry, also contact other customers relative to the entire Scintilla line. The total area covered from the Burbank office covers the twelve Western states of Washington, Idaho, Montana, North and South Dakota, Nebraska, Wyoming, Utah, Arizone, Nevada, Oregon and California.

Another of the District Offices is located in Detroit. The office is staffed by one Application Engineer and a Clerk. This office is mainly interested in ordnance applications of the Scintilla line in conjunction with the Army Detroit Ordnance Plant. The entire line is sold through Michigan, Indiana (except Indianapolis) and Ohio (except Dayton, Columbus and Cincinnati).

An office was located in Jenkintown, Pennsylvania until January 1, 1957, when it was moved to Teaneck, New Jersey. This move was made in conjunction with an increase in Application Engineers from one to two. This move was predicated on the fact that the Teaneck location would allow one of the representatives to concentrate his coverage on the metropolitan New York City-Long Island area while the other covered New Jersey and Pennsylvania. The concentration of the New York City representative is in the connector field, while the New Jersey-Pennsylvania representative sells the entire line without major concentration.

Another office is maintained in Dallas, Texas, and is staffed by two Application Engineers and a Secretary. This office is maintained primarily to provide coverage of the aircraft industry located in the Dallas-Fort Worth area. The entire line is sold from this office through the states of Kansas, Colorado, New Mexico, Oklahoma, Texas, Arkansas and Louisiana.

The Milwaukee office is maintained primarily to provide sales coverage for the connector line in the Midwest area. There is one Application Engineer and a Clerk maintained in the office, which is responsible for the states of Minnesota, Wisconsin, Iowa, Illinois and Missouri.

An Application Engineer and a Clerk are maintained in Dayton, Ohio, which provides an excellent point for coverage of the many variations of modern and future possible applications under test at Wright-Patterson Air Force Base. While the primary interest of this office is the aviation field, the line of products generally is sold in the cities of Dayton, Columbus and Cincinnati, Ohio and Indianapolis, Indiana from this office.

There is another office maintained in Washington, D.C. This office, staffed by two Application Engineers is used as a legislative and procurement listening post in addition to the sales of products through the southeastern states. The two representatives headquartered here cover the states of West

Virginia, Maryland, Delaware, Virginia, Kentucky, North and South Carolina, Tennessee, Alabama, Georgia and Florida.

Under the present sales coverage scheme, the Sales Representatives do not call upon distributors, this field being considered after market sales and thus the responsibility of the Trade Sales Representatives of the Service Department.

Sales Representatives are not paid any bonuses or commissions, rather being paid a flat salary plus expenses. Merit raises are given on the basis of longevity and merit rating. The merit rating scheme applied to the Sales Representatives is administered by the Sales Manager, the Assistant Sales Manager and the Assistant to the Sales Manager as a group. Any merit increase is predicated by this group upon the sales volume of the office affected plus consideration of any comments from customers relative to the representative's performance. This group, after consideration of each representative for an increase submits such recommendations to the Personnel Department who may or may not concur in such a raise. The final decision relative to the question rests with the Personnel Department Salary Administrator.

Sales Representatives, upon initial employment, are given a twenty-four week indoctrination program which consists of Customer Relations, Liaison between customer and Scintilla, Engineering, and a six-week period in the Engineering Laboratory.

If an experienced salesman is employed, this system is modified somewhat in that the above cycle is reduced to one month. Upon completion of this indoctrination, the trainee is sent to the field to work for six months with an Application Engineer. At the end of this period he is returned to the plant for briefing on the product area which is his desired area of concentration. After this, he is returned to the field as a full Sales Representative.

Certain functions of selling now incorporated in the Trade Sales Section of the Service Department should be integrated with this section if recommendations relative to organization are accepted.

9.26 Liaison Information and Publications. The Liaison Information and Publications section is headed by an Application Engineer who directs a staff of eight composed of Artists

and Illustrators, Technical Writers, and Statistical Clerks in the preparation of sales literature, and the accumulation of information from manufacturing reports, and from government reports.

Any request for printing is approved by the Sales Manager and is given to a Technical Writer for developing the message desired. In preparation of the message, the Technical Writer will co-ordinate with the Artist and Illustrator and/or the photographer to develop a suitable illustration to tell the sales story. When this mechanical (instruction and layout for the printer) procedure has been developed, the section head negotiates with a local printer to supply the desired copy.

This section is also the central files section of the Department. These files consist of Scintilla prints, customer prints, government specifications, customer specifications and Scintilla specifications.

The Information Section deals with customers or prospective customers who make inquiries relative to an advertisement or who requests basic information on products. There is no co-ordination between this section and the Sales Representatives relative to a follow-up call in reply to an inquiry from a prospective customer.

In addition to the foregoing functions this section prepares material for the Advertising Manager in much the same manner as the preparation of sales catalogs or literature.

To attempt to eliminate some of the overlap existing between the functions of this section and the Service Publication Section of the Service Department, it is suggested that these two sections be merged and placed under the immediate supervision of the Advertising Manager. In this suggested merger, the statistical and central files section are recommended for removal to the statistical section of the Sales Department.

It is also recommended that a positive follow-up system relative to inquiries be implemented which would provide for this section to keep the Sales Representatives in the field alerted as to who has inquired relative to what products. It is believed that the expenditure necessary to institute this system might possibly lead to an expansion of the customer list with a resultant increase in sales. If nothing else, it is considered good customer relations to

have a representative call upon an inquiring concern to express Scintilla's thanks for inquiring.

9.27 Government Orders. This section is headed by an Assistant Supervisor who is assisted by three Correspondence Expediters and five Clerks.

The section is in being wholly to process the orders received from governmental agencies, regardless of product line. Its existence is considered necessary due to the specialization required in legal liaison, governmental packaging requirements and other facets unique to governmental contract requirements.

The functions of this section would appear to overlap those of the various other product sections, and indeed they do to a degree. This is not considered unreasonable in view of the unique features involved in many governmental orders. The provision of specialists to handle these details is considered essential to provide the service which Scintilla attempts to render to any customer.

The Correspondence Expediters assigned to this section function in the same manner as those in other departmental product sections, with the exception of electrical connectors. They follow an order to which they are assigned throughout its processing. In the electrical connector line, once the firm order is received, the responsibility is shifted to the connector section for processing and follow-up by an assigned Expediter. While this seems odd at first glance, the reasons for this shift of responsibility in this one instance is caused by the high degree of specialization required in the processing of connector orders. Additionally, it is considered an appropriate procedure to reduce confusion when the connector section is physically removed from the Sales office.

9.28 Stockroom "S". This storeroom is maintained to stock and dispense spare parts as required by customers. Stock is maintained on the basis of historical and usage data and the estimated demand for spare parts. Electrical connectors are not stocked but are allocated directly to firm customer orders rather than into stock. This phase of the activity is expected to be removed to the connector section of the plant when that section ultimately moves to the new plant addition.

The stockroom is staffed by a Foreman, five Clerks and eighteen Material Handlers. About half of the Material Handlers employed are engaged in the processing of connector orders.

A rather serious communication problem exists between the stockroom and the main sales office. Procedures now used require the transfer of a large amount of paperwork daily. With the stockroom located approximately 750 feet from the sales office, the movement of this volume of IBM cards, shippers, etc., becomes a problem in communications. A facsimile system has been tried, but was found wanting in that it could not process batched IBM cards at sufficient speed, and was subsequently removed. Inquiries into the possibilities of a pneumatic tube or conveyor system proved fruitless due to a lack of flexibility coupled with high installation costs. The Sales Department is now investigating an improved facsimile system which appears promising to the solution of the problem. In the interim, persons going between the two areas are utilized as messengers, or the Foreman makes frequent trips to the sales office to keep the paper moving.

Through the use of an IBM sorting machine located in the stockroom, effective allocation of received materials is accomplished either to an order in process or to inventory. Mark sensing pencils are used to revise balances remaining and other figures on inventory and order cards, thus supplying fast revision to the constantly changing balances. In the processing of material, four IBM cards supply the basic data for a transaction. These are (1) The Delivery Ticket which accompanies the finished goods from the Manufacturing Department to the storeroom. (2) A duplicate Holding Card which is on file in the stockroom and which shows the material which has been ordered from the Manufacturing Department. (3) A Customer Firm Order Card which is likewise held in the stockroom and which shows the parts which are on order by customers and awaiting completion of manufacture. (4) An Inventory Card which shows the material in stock.

The Original Holding Card and Duplicate Bin Cards are held by the sales office, thus in effect giving the main sales office a complete picture of what is physically in stock in the stockroom as well as what orders are awaiting the completion of manufacture. The overall system is considered quite satisfactory and working well, except for the communication difficulty previously mentioned.

Some difficulty is encountered in the stockroom in the makeup of modification kits. At present, orders for kits are received piecemeal from the sales office. A change in this procedure to state the master kit number and the component parts of that kit on a Firm Order Card is recommended. This change would allow the allocation clerk to accumulate parts and to ship them as feasible shipping lots are accumulated.

The stockroom is on a staggered hour work day -- reporting for work one hour earlier than the main production force. This gives stockroom personnel an opportunity to clear up the accumulation of parts from the second shift the previous night. This results in their being clear of backlog at or shortly after the commencement of the regular work day.

The use of a large blackboard to show all clerks at a glance what parts are in a "hot" status relative to delivery is considered most effective. The use of this board allows all clerks to check for "hot" items at a glance when processing Delivery Tickets.

9.29 Statistical. This section is headed by a Supervisor, under whom there are sixteen Clerks. While the statistical function for the Sales Department is performed in this section, the title is somewhat misleading, in that the section is also charged with such duties as order registration, and the typing and checking of shippers.

Primarily, the section is concerned with the preparation of the periodic reports to Corporation and Scintilla Management. In company with Service, Sales, and Production Managers, this section prepares the annual sales programs showing the projected sales over a two-year period commencing each October 1. The compilation of these programs is a combination of usage data, market potentialities, and other available evidence which may contribute to the over-all picture. These programs are revised each six months. The scrutiny of the Daily Advance Digest and Daily Shipping Sheets provides much valuable information in compiling the projected figures.

To supplement the yearly program mentioned above, the section prepares a three-month projection of anticipated sales volume for each of the three months. This is designed

to supplement the master program in bringing the figures up to date on a monthly basis for comparison with the programmed figures. These revised figures are a joint effort on the part of the Supervisor and the Production Manager.

In preparing any forecast, all lines are broken down by components so as to make maximum use of common components. In addition, such information as the number and type aircraft being produced, the manufacturer and completion date are used. Coupled with available usage data, the expected sales can be forecast, using statistical analysis. Programs of aircraft being projected are closely watched in conjunction with the preparation of these forecasts.

It is considered worthy of note that in 1955, based on predicted sales of $28,835,749, the actual figure was 1.4% above the predicted figure. In 1956, the actual figure was 0.15% below the predicted figure based on predicted sales of $32,347,160.

As mentioned in the discussion of the Liaison Information and Publication Section, it is recommended that the Statistical and Filing functions of that section be integrated into the Statistical section, if the merger suggested is implemented. Likewise, the Statistical function of the Trade Sales Section of the Service Department should be integrated into this section if organization recommendations relative thereto are implemented.

9.30 Summary of Recommendations.

1. Integrate the Trade Sales Section of the Service Department into the District Offices and Statistical Section of the Sales Department.

2. Integrate the Service Publication Section of the Service Department into the Liaison and Public Information Section of the Sales Department.

3. Eliminate the position of Assistant to the Sales Manager.

4. Re-designate the present Advertising Manager as Assistant Sales Manager, Advertising to supervise the combined Service Publication/Liaison and Public Information Section.

5. Provide a central scheduling function in the Manufacturing

Department so as to provide Sales with more reliable information relative to the progress of orders.

6. Integrate a uniform classification relative to the electrical connector line.

7. Re-evaluate the potential existing relative to the Diesel Fuel Injection line.

8. Remove the Central Files and Statistical Sections of the Liaison Information and Publication Section to the Statistical Section.

9. Implement a follow-up system to provide for a Sales Representative to call on prospective customers who make inquiries to the plant directly.

10. Provide Stockroom "S" with expanded information for making up modification kits.

9.4 Service Department. The Service Department provides after-market parts and service for Scintilla customers so as to insure high quality performance from the products: after-market, as used here, refers to product service and/or sales performed after original product deliveries. Such services have built up a considerable goodwill for the Division and is presently considered by customers and Scintilla alike to be a major contributing factor to continued good business relations with the Division.

The department is divided into two (2) general groups of Technical Service and Service Sales; the groups are further divided into specialty sections as indicated below:

A. Technical Service Group consisting of the Service Tool Engineering, Service Engineering, Technical Field Service, and Technical Investigations Sections.

B. Service Sales Group consisting of the Customer Contact Service Repair, Trade Sales, Service Publications and Technical Training Sections.

The department is organized such that by co-ordinating with the Bendix West Coast Division service can be provided for

Scintilla customers throughout the United States. Service outside the continental limits of the United States, except Canada, is provided through the Bendix International Division: the Aviation Electric, Ltd. of Montreal, Canada, acts for the Division in that country. After-market sales coverage is provided by the department throughout the United States and Canada.

The Service Department operates on a budget allotted through the Director, Sales, Service and Advertising. Operating expenses for the past Scintilla fiscal year amounted to approximately 2.39 percent of the total Scintilla sales volume while after-market sales effort accounted for approximately 13.9 percent of the Division's total sales volume.

The Bendix International Ignition Conference is held annually in Sidney, New York, as part of the Division's ignition service: the conference is sponsored by the Service and Engineering Departments. Attendance at the conference consists of personnel from airlines, the military, engine and accessory manufacturers, and other personnel who may have a working interest in Scintilla ignition systems. The conference provides a basis for a comprehensive disucssion of problems confronting the end-product users of Scintilla products.

9.41 Technical Investigations Section. The technical investigations section is responsible for investigation of customer complaints, co-ordination of customer reports with the inspection department, and contact with customers on technical questions and service problems. In effect, it is a co-ordinating medium between customers and Scintilla for problems arising as a result of customer dissatisfaction with a product.

9.411 Investigation of Customer Complaints. Although dissatisfaction with a product may result from various causes, the specific problems most generally processed by the section are those involving non-standard products, i.e., products that passed Scintilla inspection before they were delivered to the customer, but because of the sampling technique, or possible other reasons, were not one-hundred percent (100%) standard quality products when checked by the customer.

All complaints received from the field are investigated by the section so that it may be determined whether the

reported deficiency is one of quality, product design, or as a result of other causes, and to establish the exact nature and extent of the problem.

The report will generally be accompanied by a sample of the product or a shipment may be returned on the basis of a sample inspection performed by the customer. Reports not accompanied by physical units, and for which the exact nature or reason for the complaint cannot be readily determined, are generally investigated by a technical field service representative or by an investigator dispatched from Scintilla to the customer's location.

Returned products are subjected to one-hundred percent inspection by the cognizant technical investigator. Deficiencies determined to be the result of product design are referred to the service engineering section for further investigation, while those considered by the investigators to be product quality are recorded for presentation and discussion at the daily Inspection-Service Meeting.

9.412 Co-ordination of Field Problems. The inspection group of the quality control department maintains a list of all complaint report items received from the field (through the technical investigations section) to which is added the daily list of items prepared by the investigations section. The inspection group investigates and appraises each item and through the Inspection-Service Meeting furnishes the technical investigations section with details of necessary action required to provide the customer with standard quality products.

Items considered at the Inspection-Service Meeting that are determined to be other than quality deficiencies are either referred to the cognizant department or are passed to the service engineering section for investigation and appraisal. The technical investigations section is guided for customer contact on design or engineering problems by the conclusions reached by either the service engineering section, the engineering department, or the Engineering-Service Meeting.

9.413 Customer Contact on Defective Products. After the technical investigations section has determined that a justified complaint has been made by a customer, it evolves upon

that section to take such action as may be necessary to provide customer satisfaction and insure that the product "remains sold".

Complaints are, in the main, the result of quality. Consequently, customer satisfaction can generally be gained by providing standard quality replacement products. Such replacement can be accomplished either through the customer's central distributor or directly from Scintilla. If repair of the product in the field is more practical than replacement, the technical field service representative of that particular area may be furnished the necessary parts and assistance to effect the repair.

9.414 Technical Investigations Records. The section has compiled a card file of previously encountered problems in connection with various parts and components. Reports are also maintained on file that indicate the action taken to correct the various problems. The two (2) files taken together provide a ready reference or guide that can be used to evaluate various problems. Presently however, it is necessary that one be able to associate customers with the various parts and components in order to co-ordinate the two (2) files; a cross reference index would facilitate use of the files.

The section also maintains records relative to ignition system removals. This particular set of records, when detailed to indicate "justified" and "unjustified" removals, serve as an excellent basis for evaluating actual ignition system operations as against inefficient trouble analysis by the airline maintenance crews. The records are presented and discussed in considerable detail at the International Ignition Conference.

The section compiles and maintains records, by products, that indicate the numbers of items rejected by customers because of non-standard quality. It is considered that the records reliably indicate the general quality efficiency of the production and inspection departments.

9.415 Summary of Conclusions.

1. Detailed investigation of customer complaints, and complete inspection of returned products, is necessary,

not only to establish the extent of Scintilla's responsibility in connection with the complaint, but also to evaluate design, production and inspection techniques - particularly the latter. However, the necessity for actual physical inspection by the technical investigations section is questionable. Since the inspection department is equipped and trained to perform the inspections, and because duplication of effort occurs when the inspection department also inspects the returned products, it appears that a procedure similar to that outlined below might prove to be more feasible from an overall Scintilla efficiency point of view.

A. A technical investigator in the service department evaluates the customer's written report only. Deficiency items considered to be product design routed directly to the service engineering section and those considered to be quality rejects noted on the list to be brought to the attention of the inspection department at the daily Inspection-Service Meeting.

B. The inspection department perform such inspections of the returned product as are necessary to provide the technical investigator with pertinent information that will assist in making an evaluation on which to base action to attain customer satisfaction.

2. The records maintained by the section, particularly in connection with customer reports regarding product quality, are detailed and provide data on which to evaluate a large segment of Scintilla's operations. However, if the maximum potential of such records is to be realized as a preventive rather than a corrective device, the concluded details must be communicated formally to management personnel who are in a position to take corrective action.

3. It appeared during the investigation that present Scintilla policy regards customer contact and general communication with other departments to be primary responsibilities of the Service Department Manager, even though action authority in some areas may have been delegated to the assistant department head. Such procedure is considered to be good policy; however, adoption of the Service Department Organization structure recommended elsewhere in this report would not permit detailed personal attention in all responsible areas. In general, every consideration appears to justify establishment of a Staff Assistant to the Service Department Manager for Technical Investigations;

such position to replace the present Technical Investigations Section. Establishment of such a position would enable the manager to centralize his efforts in co-ordination of all field problems. The same individual would attend - with technical advisors as required - all meetings in connection with customer problems, maintain evaluation records mentioned above, and process all customer contact communications in matters of Service Department Policy.

9.42 Technical Field Service Section. The function of the technical field service section is to provide the users of Scintilla products with technical assistance so as to insure that maintenance and overhaul is in accordance with prescribed procedures. The service is provided by ten (10) field representatives who are responsible for specifically assigned areas within the United States east of a defined line through the Rocky Mountains area. Four (4) additional field representatives and one (1) supervisor are assigned to the Bendix West Coast Division for coverage of that area. The representatives make calls upon airline operation and overhaul shops, industrial establishments, engine manufacturers and commercial overhaul shops.

9.421 Field Service Functions. The primary concern of the technical field service representatives is to assure customer satisfaction with products already marketed. A specific area and "home base of operations" is assigned each representative by the section supervisor and a tentative schedule of routine calls is developed; however, the schedule is flexible and may be altered by either the representative or supervisor to meet unforeseen circumstances. The representative files a weekly whereabouts itinerary with the supervisor by mail so that he can be contacted at any time if the schedule of calls should differ from the routine.

The representatives assist the operator's maintenance and overhaul groups on technical problems and observe to insure that maintenance and overhaul of Scintilla products is performed according to approved methods. Such calls also provide an opportunity to obtain usage data, information of value in establishing design changes or more efficient maintenance techniques, and the progress of customer conducted service tests.

9.422 Reports. The field representatives are provided with a complete file of instructions and bulletins pertinent to the products within their assigned area; they are further assisted on particular problems by the technical sections at Scintilla. Written field reports are made to the section supervisor on a routine basis. The reports provide details of the personnel interviewed at the customer location, specific problems discussed, action taken by the representative, and other information considered pertinent to Scintilla or other field representatives. Information such as field service data or warranty claim verification is generally included in the reports as appropriate.

Observation of a random sample of the reports submitted from the field indicated that in some isolated cases the report failed to show specific action taken by a representative on problems encountered. It is understood that the reporting form will be replaced in the near future by one that should lessen the possibility of such occurrence.

9.43 Service Engineering Section. The service engineering section is responsible for engineering change co-ordination, service tool development, preparation of parts list data, preparation of a recommended list of after-market stock requirements, and co-ordination with engineering on customer reports of product difficulties. Further, although not specifically defined as such in the job description, the section performs "after market engineering" of products as may be required.

9.431 After-Market Engineering of Products. Product design defects frequently do not become apparent until after a considerable operational period. Routine maintenance and overhaul often reveals that sustained vibration, shock, etc., prove a product to be less satisfactory for the intended purpose than was originally expected. The section investigates customer or field reports of such conditions and directs their efforts toward not only providing a satisfactory operating product, but also to providing maximum economical service for the product. Such efforts may result in providing "service parts" that vary somewhat from original specifications but correct the operating problem while allowing a servicing latitude not provided in the original product. When the section's investigation yields conclusions of this nature, the engineering department is requested to provide design drawings

so that the parts may be produced as service parts. Frequently the service parts will provide a margin of profit for Scintilla comparable to that realized on the original product while providing a desired service for the customer.

9.432 Co-ordination With Engineering. Co-ordination with engineering on design changes, field service tests, and design problems reported from the field, is in general accomplished through two (2) separate weekly meetings with the engineering department.

The Engineering Change Meeting is for the purpose of discussing, with cognizant departments, contemplated changes in design of production items. The end result of change meetings is publication by the engineering department of a Notice of Change in Design. Upon receipt of the official Notice of Change in Design, the service engineering section prepares necessary publication changes, issues pertinent instructions to the field, and investigates the service stock requirements.

The weekly Engineering-Service Meeting is in general for the purpose of discussing field service tests and co-ordinating specific problems that have been indicated in field or customer reports. (Field service tests are tests conducted by end-user customers at the request of Scintilla; progress reports concerning such tests are made by technical field service representatives.) Specific operational reports of product difficulties that may be presented at the Engineering-Service Meeting consist of design or product problems that have been investigated by the service engineering section but for which additional investigation or action by the engineering department is required.

The service engineering section does not officially analyze new design or development plans until after the drawings and details have been released for production, nor does the Scintilla organization indicate service department personnel as members of the New Products Committee. It was observed that although the final design or end product is special and is released to production according to detailed customer specifications, a large percentage of the parts contained in the design are standard. Previous service records and after-market engineering data on the parts, along with known customer demands in connection with service requirements, is filed by the service department; however, there was no apparent indication that such historical information

was ever reflected in original details flowing from the design sections of the engineering department. It is felt that if during the pre-production phase of a product, consideration were given to the information possessed by the service department, the completed engineering drawings and details ultimately released for production would result in not only saving time in the long run, but in the production of a better original product.

9.433 Service Tool Development and Service Publications Data.

The technical investigations group of the service engineering section is responsible for preparing rough drafts of Maintenance and Overhaul Instructions and development of special tools and/or testers required to service products.

The section is guided in the detailed investigation of a product by the Engineering Parts List and Engineering Drawings. To further aid in conducting the investigation of new products, and if warranted, the service department orders two (2) production models of the particular unit: one (1) unit for the service engineering section and the second to be used in the service school.

Detailed investigation of the assembly, unit, or part is made by one of the technical investigators in the section. If the product is new, or sufficiently different than products previously investigated, the actual model or unit is analyzed and step-by-step assembly and/or disassembly procedures recorded, along with the nature of any special tools required to accomplish the operation. Individual subassemblies, units, and parts are investigated to determine the practicability and economics of field servicing and maintenance. Engineering tolerances and limits prescribed by engineering specifications are analyzed to determine service tolerances to be prescribed such that allowances for field testers and tool limits are recognized.

The completed investigation results in producing a rough draft of the maintenance and overhaul instructions and development of special tool and tester requirements. In addition, any specific details that may aid the service parts group in preparation of the parts lists are noted.

9.434 Service Parts Specialist. The service parts group of the service engineering section is responsible for origi-

nating the forecast of after-market stock recommendations for operational maintenance and overhaul. To carry out this function, the section is guided by the Engineering Parts Lists and Drawings furnished by the engineering department. The parts lists are marked to indicate those parts considered to be serviceable by the design section; however, the markings are used only as guides, each individual part is investigated and considered in the light of past experience with similar parts. The results of the parts specialist's investigation is origination of a Service Parts List to be included in the service publication, a service parts recommendation list for commercial customers, or a provisioning parts breakdown to be used at the military parts provisioning conference.

The Spare Parts Recommendation List is prepared for commercial customers to be used as a guide for the original stock of parts to support a new product through the first maintenance and overhaul period. The Spare Parts Recommendation list is based upon maintenance and/or overhaul of one hundred (100) units of the particular product. The list is prepared in such detail as to enable the trade sales section to prepare a production forecast based upon all the customers who are expected to use the product.

The Service Engineering Section represents Scintilla on the Military Provisioning Parts Board. A forecast similar to the one described above is prepared for each production unit to be discussed before the board. Such recommendations are considered by the Board against usage data maintained by the military and a decision is made that will enable the military to place a practical order and will permit Scintilla to formulate production planning for contemplated orders.

It will be recalled that forecasts of stock requirements are based primarily on past experience of the individual preparing the forecast. The section does, however, maintain a complete card file of all parts produced by Scintilla. The cards reflect pertinent changes that have been performed on the parts plus any information of a historical nature that may have a bearing on subsequent use of the part. It is felt that a relatively simple procedure could be established wherein usage data generated in the sales department could be furnished the service parts specialist. By performing statistical analyses of the data thus obtained, a more realistic forecast of the parts used by commercial customers could be made. It is conceivable that the present system of predicting requirements could result in producing parts into unnecessary inventory.

9.44 Service Tool Engineering. The Service Tool Engineering Section functions to design special tools and testers after the service engineering section has determined a special requirement and developed specific details of the equipment. An informal relationship between the service tool and service engineering sections enables the tool designer to cooperate with the technical investigator and, if necessary, to develop prototype tools and/or testers required to perform specific functions before final tool designs are formulated.

Detailed designs and drawings are developed by the section, along with tool and tester part numbers, in a similar manner that product details are developed in the engineering department. Tools and testers are in general manufactured by the production department; however, special requirements may at times be determined to be more economically feasible if "jobbed out" to sub-contractors for production after development of the details by the service tool engineering section.

The section is directly dependent upon the service engineering section for both requirements and details of such requirements. It is therefore considered that more efficient and co-ordinated operations would be achieved if the two (2) sections were combined.

9.45 Technical Training Section. The technical service school is located in downtown Sidney, New York, and is administered by a supervisor and two (2) instructors. The school is equipped with mock-ups, models, testers, and other equipment required to provide practical training for servicing Scintilla products. The courses offered by the school are short, on the order of five (5) days, but are concise and concentrated to train personnel in operation, maintenance, and overhaul of ignition and fuel injection products.

The service school is utilized by the Division to provide original and refresher training for Scintilla field representatives and is offered as a goodwill service to distributors and end-users of Scintilla products.

The technical training section has cognizance over the Contract Technical Representatives. This particular group of representatives, of which there are a total of ten (10), are assigned on a yearly contract basis at locations designated by the United States Air Force. The function of the representatives is to assist in training, and to provide technical advice, in the use of ignition analyzers.

9.46 Service Publications. The service publications section is headed by a supervisor who directs artists, technical writers, photographers, stanographers and clerks in producing service sales literature and service publications which consist of installation, operation and maintenance manuals, overhaul instructions, parts lists, and service bulletins.

The objective of this section is to provide service information to customers regarding Scintilla products to inform them of the latest changes or modifications to equipment and keep customers informed of the latest techniques developed for maintenance of equipment.

The rough data for the service publications is submitted to the publications section by the service engineering section of the service department. This rough data is assigned to a technical writer who prepares the material in the required format with the assistance of the artists and illustrators and/or photographers when required. When the copy has been completed by the technical writer it is delivered to the service engineering section for review for accuracy of the technical content. When approved it is returned to the supervisor of publications, who then contracts with a local printer to produce the required number of copies.

In case of the service sales literature, the trade sales section submits a request for the literature to the publications section. A technical writer prepares the format as was done with the service publications and the supervisor contracts with a local printer for the desired copies.

About fifty percent recovery of all costs of this section, exclusive of salaries, is realized through sales contracts for the service manuals.

The section also performs work for the director of advertising and for the sales publications section of the sales department on occasion.

The section maintains a printed literature storeroom and has cognizance of service publications and service sales literature for the service department, and sales catalogs which are property of the publications section of the sales department.

There is no priority assigned to the various types of work performed by this section, but service bulletins are usually considered "rush" items. There is no work schedule maintained for the work to be performed.

9.47 Trade Sales Section. The function of the trade sales section is to appoint and assist the authorized distributors of Scintilla products in promotion of after-market sales, to review and co-ordinate the after-market parts forecast with the sales department, take cognizance of warranty claims submitted by end-user customers, and to provide pricing, discount, and application information for field representatives and customers.

9.471 Distributor Appointments. The trade sales section is authorized to act for the Division in appointing Central Distributors of Bendix-Scintilla products. Such appointments are legal agreements wherein the distributorship is non-exclusive and is confined to specifically defined territories. In 1956 distributorships numbered twenty six (26) for aircraft ignition equipment, forty nine (49) for industrial ignition, and twelve (12) for fuel injection equipment. The Central Distributors are authorized to appoint service distributors and service stations for the sale, installation, service, and repair of Scintilla products. The Central Distributors are stratigically located to encompass the United States and Canada, while service distributors and service stations are so established as to insure adequate coverage within each area.

9.472 Trade Sales Field Representatives. The United States and Canada are divided into ten (10) defined areas for after-market sales coverage. A trade sales field representative is assigned to each area and has the primary objective of assisting Central Distributors in pursuing and soliciting the sale of Scintilla products to end-users. The representatives are technically trained to the extent that they are selected on the basis of technical education and experience; after appointment they receive training in the Scintilla service school as required to maintain technical proficiency on existing or new development products. With such a background, they are expected to be capable of rendering emergency technical service for customers as well as to assist in training the distributor's mechanics.

The representatives make calls upon Central Distributors within their assigned areas to insure availability of stocked parts to meet the end-user's requirements, and to offer technical advice and/or service. Random calls are also made, generally in company with a Central Distributor's repre-

sentative, upon the various service distributors or stations, and may extend such calls to include end-user purchasing agents. The latter calls may include general trades customers who operate fleets of vehicles or equipment using Scintilla products. The calls provide an opportunity for distributors and representatives to hold training meetings for the benefit of technical personnel: Scintilla also extends use of the service school at Sidney to both the distributors and service stations.

9.473 After-Market Forecasts. Trade sales is the co-ordinating section between the service and sales departments. Spare Parts Recommendation lists prepared by the service engineering section contain all units, parts, or components which the customer is expected to service; it further indicates the number of parts that the customer should have in stock for every one hundred (100) similar units to be overhauled or maintained. The trade sales section compiles and maintains records from various reports such that it is possible to predict the amount of stock inventory to be produced in support of a particular basic unit. In the case of ignition equipment, the engine hours per month per customer using the basic unit is determined. By further projecting the information, the number of engine overhauls per month and the month that such overhauls are expected to be performed in any particular distributor's area is determined. The total requirement forecast is based upon this information and is passed to the sales department for programming on the advanced digest. The detailed information is also passed to the trade sales field representatives and to cognizant central distributors.

9.474 Warranty Claims. The trade sales section has cognizance over warranty claims submitted by end-user customers. In general, claims submitted by other than the end-user (engine manufacturers) are investigated and processed through the technical investigations section. The theory of such a division of warranty claims responsibility serves to segregate general quality defects of manufacturing or design nature that may require interdepartment action and correction from those failures occuring for other reasons.

9.475 Summary of Conclusions. The trade sales section occupies a peculiar environment in that its objective is not sales to the extent of actually taking orders, nor does it perform service functions to the extent that it exists for the purpose of rendering technical service; however, in effect, the section performs both sales and service.

In view of the fact that the technical field service representatives are assigned throughout the country to provide technical service, such service is provided by the trade sales representatives more as a "stop-gap" or emergency measure than as routine. Promotion of after-market sales, distributor appointments, and market forecasts however appear to be sales functions.

At the present time control of the trade sales representatives is centralized with the section supervisor at Scintilla exercising general direction over all the representatives. Such control is advantageous for general planning, but control that will permit immediate observation of a neglected market might better be accomplished through the District Application Engineers. Present control procedures include maintaining a continuous plot of actual sales in an area against predicted sales opportunities; the theory of such a system is good but is considered to be accurate only insofar as the predictions are accurate; again the probability of more accurate predictions that could be made by a district representative should be considered.

It is felt that greater overall operating efficiency would accrue to Scintilla if the section were integrated into the sales department for supervision.

9.48 Customer Contact and Service Repair. The customer contact and service repair section consists of an office force and a repair department. The objectives of this section are to keep all customers satisfied, hold their goodwill and to operate at a profit for Scintilla.

This section handles equipment which has been returned to the plant for overhaul, modifications, corrections to rejected equipment, and repairs or correction to warranty equipment.

9.481 Office Force.

The office force consists of the supervisor, assistant supervisor, customer contact men and stenographers. The assistant supervisor, in addition to his other duties, personally handles all government contract work for the section. The customer contact men are assigned a number of customers and any correspondence with those companies is

handled by that individual. These contact men are responsible for making estimates for modifications and other repair work and for securing a purchase order from the customer. After the purchase order has been received they issue a repair order which is authority for the repair department to perform the required work.

After the repair department has completed the required work and the equipment has been shipped, the repair order is returned to the customer contact section for labor charges which have been obtained from the payroll section. The repair order is then sent to the billing department for pricing of materials and is returned to the customer contact section. After the repair order has been checked and adjustments made, when necessary, it is returned to the billing department for customer billing.

All action on rejected equipment is co-ordinated with the quality control department and with the technical investigation section of the service department.

9.482 Repair Department. The repair department is under the general supervision of the customer contact and repair department supervisor and under the direct supervision of a foreman.

Returned equipment is delivered to the repair department by the receiving department and is held until all necessary action has been taken and a repair order has been issued by the customer contact section. When the repair order has been received the equipment is assigned to a repair man and the necessary work is performed. If the repair department cannot accomplish the work, the supervisor must make arrangements with the production department to do the work.

After the necessary corrective action has been taken, the equipment is inspected by a company inspector, and in case of government equipment, it is inspected by a government inspector. The equipment is then sent to the shipping department for packaging and shipping.

The repair department works on a straight day work basis and the pay rate is high enough to make it a desirable department in which to work. The mechanics must be qualified on all equipment manufactured by the company.

This department spends about sixty percent of its effort in overhauls, repairs and modifications of returned equipment, about ten percent on conversions and modifications of stock "S" equipment, and about thirty percent on rejects or warranty equipment.

The repair department maintains a stockroom for spare parts which are drawn from stock "S" (sales) stockroom and stock "C" (production) stockroom. The stockroom carries about six months supply of spare parts, valued at about seventy five thousand dollars. The floor space occupied by this storeroom is about three hundred square feet: an inventory of the spare parts is held annually.

The repair department does not maintain a schedule for work to be performed.

9.49 Summary of Recommendations.

1. Establish the position of "Assistant to the Service Manager for Technical Investigations" to replace the present Technical Investigations Section: qualifications for the position should as a minimum, be similar to those required for the Service Engineering Section personnel.

2. Discontinue physical inspection, within the service department, of units rejected by customers for quality reasons; reliance upon reports by the inspection department should be adequate.

3. Appoint the Assistant to the Service Manager to be a member of the Engineering-Service Meeting to effect co-ordination with the Engineering Department.

4. Establish a system of presenting the summary of customer reports on products rejected for quality to management personnel who are in a position to effectively use the information for corrective action.

5. Restudy the positions of the Service Engineering Section with a view to possibly upgrading the positions when all functions performed by the section are considered.

6. Establish co-ordination between the Service and Engineering Departments on new design products before the details are released for production.

7. Institute a procedure whereby commercial parts usage data is furnished from the sales department to the service parts specialist.

8. Combine the Service Engineering and Service Tool Engineering Sections.

9. Integrate the Trade Sales Section into the Sales Department.

10. Establish a general publications section under the direction of the Advertising Manager; such section to replace the present Service Publications Section.

11. Establish a classification and priority system for publications work.

12. Establish and maintain a work schedule for preparation of publications.

13. Establish and maintain a schedule for performing repair work in the Customer Contact Service Repair Section.

14. Eliminate the stockroom presently under cognizance of the Service Repair Section and utilize stock "S" and stock "C" storerooms in lieu thereof.

In conclusion, adopting the recommendations listed above will result in a Service Department consisting of Service Engineering, Technical Field Service, Technical Training, and Customer Contact Service Repair Sections. Functions of the four (4) sections will be such that they can be efficiently supervised by one (1) principal and the section supervisor will have clearly defined responsibilities concentrated completely in the area of Service to the customers. Department liaison and cooperative planning assistance will be provided by the assistant to the Service Manager for Technical Investigations. Customer contact will be centralized in the office of the manager thereby lessening any possibility of conflicting policy decisions.

9.50 Advertising, General Discussion. The central advertising organization at the headquarters of the Bendix Aviation Corporation, consists of a Director of Advertising and Publicity who acts in an advisory capacity in the formulation of each division's advertising program. For example, his office establishes the policy for news releases by the division advertising departments.

The advertising director actively participates in advertising for the corporation through MacManus, John and Adams, Inc., the advertising agency handling its account. The media used for corporation advertising is nationally circulated magazines. The advertising agency periodically contracts for Starch readership reports and Readex, a reader interest report, which is conducted by Time magazine in order to evaluate the various advertising messages released and the corporation and divisions are notified of the results of these reports.

In addition to the advertising agency the corporation retains a public relations agency, Carl Byoir Associates, of New York City. This agency is responsible for the preparation of the annual report for the Bendix Aviation Corporation. This agency also prepares news releases on new products, new product applications, new facilities and personnel changes at the executive level.

There is also a corporation Exhibit Manager, who operates under the Advertising Manager at the Bendix Products Division, and he is responsible for co-ordination and manufacture of all props and material for displays to be used in shows and exhibits participated in by the corporation or its divisions. The cost of this service is met by a twenty five percent mark up on show costs and each division is billed monthly for the shows in which it participates.

At Scintilla, the advertising effort is directed by an Advertising Manager who reports to the division's Director of Sales, Service and Advertising.

The chief objective of this office is to keep the Scintilla name continually before the public. To accomplish this it tells a product story for each product manufactured and it tries to gain and keep its customers' and potential customers' goodwill for Scintilla and for the Bendix Aviation Corporation.

The annual advertising budget for the division is about one half of one percent of its anticipated annual gross sales.

The products made by Scintilla are divided into the following broad categories and each is featured from time to time in individual ads.

1. Electrical connectors.
2. Diesel fuel injection equipment.
3. Industrial engineering magnetos.
4. Ignition systems, piston type aircraft.
5. Ignition analyzer.
6. Radio shielding harness and protected wiring assembly.
7. Ignition systems, Jet, turbo-jet and turbo prop engine.
8. Ignition switches.

The exceptionally good service offered by Scintilla has contributed to the division's success; hence, it has seemed advisable to stress service in the advertising.

The following forms of advertising are used:

1. Trade magazine advertising.
2. Booths at shows and exhibitions.
3. Sales Catalogs.
4. Signs and displays.
5. Sales promotional material, such as letters, pens and etc.

The advertising manager does not have a staff to prepare the advertising but must use artists, writers and photographers in the sales and service departments.

About sixty percent of the advertising manager's time is utilized for the advertising effort and the remaining time is spent in committee work and in performing functions as an "assistant to" the Director of Sales, Service and Advertising.

There appears to be some duplication of effort among the Advertising Manager, the Supervisor of Publications in the Service Department and the Supervisor of Publications in the Sales Department. This is evidenced by the fact that all of these people independently contract with local printers for work desired for their departments. A random sample of displays of each department showed that in at least one instance, different displays had been prepared by all three to transmit basically the same message about the same product.

9.51 Direct Trade Advertising. All of Scintilla's trade paper advertising is handled through MacManus, John and Adams, Inc. This advertising agency operates on a fifteen

percent agency discount which it receives from the publisher on the billed cost of space to Scintilla. Art work done by the agency is billed to Scintilla at cost plus fifteen percent.

About fifty-two trade journals and magazines are presently being used to carry the Scintilla message. These are in the fields of aviation, electrical connectors, industrial magnetos and fuel injection equipment.

After the Scintilla advertising budget has been prepared by the Advertising Manager and approved by the General Manager the agency is notified of the amount to be utilized in direct trade advertising. It then prepares a schedule for the year for insertions in the various magazines.

The Advertising Manager is responsible for preparing the basic message to be carried in the magazine advertising. The final preparation of each ad however is the responsibility of the agency but the agency's work must be submitted to the Advertising Manager for his approval before insertion.

About seventy five percent of Scintilla's advertising budget is expended in trade journal advertising.

9.52 Trade Shows and Exhibitions. Trade shows and exhibitions are promoted and scheduled by various trade associations. Space where they may display their products is sold to interested manufacturers.

Scintilla's displays for these shows are made by the corporation's "Exhibit Manager" who also co-ordinates such advertising effort for all divisions of Bendix Aviation Corporation.

The Advertising Manager attends and actively participates in all shows and exhibitions and is assisted by the sales application engineers assigned to the area in which the exhibits are displayed.

About fifteen percent of the advertising budget is utilized for trade shows.

9.53 Other Advertising Media Used. About ten percent of the advertising budget is spent for miscellaneous forms of advertising which include:

1. Sales catalogs. These are prepared by the "publications section" of the Sales Department and are distributed by Salesmen in the field and mailed to customers or prospective customers on request. The distribution of this material is controlled by the Sales Department.

2. Signs and displays of a local nature. These are prepared by a local contractor.

3. Sales promotional material, which consists of pens, pencils and etc., bearing the Scintilla trade mark.

Other forms of advertising not charged as an advertising expense but nevertheless considered effective media are:

1. News releases on new products and carried without charge by newspapers and magazines.

2. Vendor complimentary advertising in magazines and other media.

3. Training school conducted by the Service Department.

4. An aircraft ignition conference which is held annually at Scintilla. The minutes of these meetings are published and distributed to all participating in the activities.

5. Service sales literature which is prepared and distributed by the Service Department.

6. Packing boxes and shipping cartons bearing the company trade mark.

9.54 Summary of Recommendations. It is recommended that the publications sections of the sales and service departments be combined and put under the supervision of the Advertising Manager in order to eliminate duplication in the advertising effort and to gain the maximum financial advantage that can be secured through larger purchases of materials and printing. Better utilization of personnel will be possible also with a single head.

# CHAPTER X - QUALITY CONTROL

10.1 General. At Scintilla, quality control standards are based on a general objective to produce only high quality products. These standards are articulated on the basis of customer requirements. Accordingly, since the largest volume of product is destined ultimately for military application, the United States Air Force Military Specification of Quality Control Requirements, MIL-Q-5923C (USAF) dated 15 March 1956, is used as a general guide for the establishment of quality standards. These requirements are modified as may be necessary in those instances where non-military customers so require.

In accordance with this basic philosophy and with contract prints and specifications, the basis for all quality standards is developed by the Engineering Department in the form of production drawings and specifications. The Quality Control Department interprets and, where necessary, adds to these engineering standards. The final result represents the "Scintilla Standard of Quality".

Evaluation of product quality against the standards is performed by the Inspection Branch of the Quality Control Department.

Corrective action to maintain and insure standard performance is initiated and co-ordinated by the Quality Control Branch of the Quality Control Department.

It is our purpose in this report to review the manner in which Scintilla functions to maintain quality control in terms of the general departmental objectives, the organization of the Quality Control Department from a quality control point of view, quality control methods and procedures, and inspection methods and procedures. Following this is a discussion and analysis of the quality control function and of the inspection function; and, finally, recommendations whereby the effectiveness as well as the economy of the department might be improved.

10.2 Objectives. The overall objectives of the Quality Control Department are set forth in the Scintilla Quality Control Manual as follows:

"Maintenance of a reputation for high quality. Dependable product is a Bendix Corporation and Scintilla Division policy.

"Scintilla management has organized a complete quality control system and has charged the Quality Control Department with the responsibility of insuring that a high quality reputation is maintained.

"The Quality Control Department reports directly to the General Manager and has been invested with the authority to enforce conformance to design requirements, and when in the interest of the Division, to question engineering judgment.

"As a part of the Scintilla team, the Quality Control Department assists in economical and high quantity production of product but insists on quality standards compatible with the products end use and with customer commitments.

"In order to discharge the responsibilities placed upon it by management, the quality control function, either directly or indirectly, is concerned with all phases of the Division's operations. An active liaison is maintained with the Engineering, Manufacturing, Sales, Service, Purchasing, Accounting, Industrial Relations, Tool Engineering, and Production Control Departments."

10.3 The Organization - A Quality Control Point of View. A study of the organizational structure of the Quality Control Department is presented in Chapter I of this report.

There is a division in the organization between the quality control functions and the inspection function. This is a desirable arrangement since the primary purpose of quality control is to achieve a quality product, while the purpose of inspection is to determine whether or not the quality is acceptable, and to screen out sub-standard product.

It is of interest to note that there are some 465 inspectors and 30 supervisors assigned to the Inspection Branch and only 13 Quality Control Analysts along with three Quality Control Supervisors in the quality control branch. The time of the analysts is largely taken up with assigned duties such as inspection routine preparation, reports analysis and preparation, die and mold approval, process control,

training, etc. Relatively little time is available for investigation of quality control problems and co-ordination with other departments. A considerable amount of investigation and co-ordination is performed by the Quality Control Manager, his assistant, the Chief Inspector, the two Assistant Inspectors, and other inspection supervisors. There is an excellent relationship within this group that results in a co-ordinated effort to solve problems on an informal basis and with a large degree of initiative assumed by each individual.

Promotion within the department has been limited to Scintilla personnel. Without exception, those personnel with whom the writer had contact were very capable and demonstrated enthusiasm for and interest in their work. The department is well informed, in general, on advancements in the field of quality control. However, it is evident that the approach is colored and sometimes limited by individual experience at Scintilla over the years.

10.4 Quality Control Methods and Procedures. In discussing methods and procedures employed at Scintilla to perform the task of quality control, we shall take the following definition of the "job" of quality control by Fiegenbaum (101) as a frame of reference:

"New-Design Control--New design control involves the establishment and specification of the desirable cost-quality and performance quality standards for the product, including the elimination or location of possible sources of manufacturing troubles before the start of formal production.

"Incoming-Material Control--Incoming-material control involves the receiving and stocking, at the most economical levels of quantity of only those parts the quality of which conforms to the specification requirements.

"Product Control--Product control involves the control of processed parts and assemblies at the source of production so that departures from the quality specification can be corrected before defective products are produced.

"Special Process Studies--Special process studies involve conducting investigations and tests to locate the causes of defective products and to determine the possibility

of improving product-quality characteristics."

Following are the methods and procedures employed by Scintilla to perform these four tasks:

10.41 New-Design Control. Drawings, engineering instructions, and specifications are released to production by the Engineering Department. A procedure is employed for production review of drawings prior to their release. Thus the Quality Control Department enters the picture only after the drawings are released and production layouts are prepared. Quality standards are therefore established by the Engineering Department. The Quality Control Department checks the prints, test specifications, and instructions for conformance to required quality standards, co-ordinates the resolution of discrepancies with Engineering, and specifies any additional quality requirements that may be necessary to meet customer specifications and Scintilla standards.

Review and approval by the Quality Control Department is required for all engineering changes.

10.42 Incoming-Material Control. Vendor certification and government inspection, where applicable, is required for all incoming raw material and parts. Inspection and laboratory test procedures are specified to insure that only parts and materials of acceptable quality level enter the storerooms. Defective material is normally returned to the vendor. Provision is made for Materials Review Board action on defective parts and for rework at Scintilla when the urgency or economy of the situation so dictates.

Raw materials are identified by color code prior to entrance into the storeroom.

10.43 Product Control.

A. Process Control--All processes are carefully controlled by process inspection procedures. A comprehensive program for certification of operators is carried out by the Quality Control Department.

B. Die and Mold Control--The Quality Control Department checks sample parts from all pattern equipment,

dies, molds, etc. Quality Control approval of a sample is required prior to each production run.

C. Parts Manufacturing Control--In one instance control charts of machine performance are maintained. The more general procedure is a first piece inspection by floor inspectors followed by a random check of the output during a production run. In addition an inspection allowance is included in the operator's time standards. The floor inspectors "punch off" the operator's time cards for quantity and quality.

D. Assembly Control--All parts are inspected by bench inspectors to insure their quality prior to the assembly phase of production. Floor inspectors conduct a patrol-type check during the assembly operations.

E. Tool, Gage, and Test Equipment Control--Inspection of all tools except those that establish dimensions that cannot otherwise be checked by inspection is performed by the Manufacturing Department. Quality Control specifies and carries out periodic inspection requirements for all gages, critical tools, and all test equipment to insure their accuracy.

F. Final Inspection and Test--Final inspection, life tests, performance tests, etc. are required by the Quality Control Department as necessary to insure optimum quality of out-going product. The Quality Control Department has final authority to stop shipment when the product is determined to be defective.

G. Preservation and Packaging Control--The Quality Control Department insures conformity to customer requirements for preservation and packaging by review of the processes involved and by inspection at the shipping area.

H. Materials Review Board--Scrap items are reviewed for disposition by a board on which the Quality Control and Engineering Departments and the resident Air Force Inspector (or other applicable customer representative ) are represented. The board approves salvage of those items which can be reworked economically and in a manner acceptable to the customer.

I. Engineering and Manufacturing Liaison--Liaison with Engineering and Manufacturing is maintained at all levels

of the Quality Control and Inspection organizations to solve day to day problems, to facilitate and improve quality of product, and to maintain economy of production consistent with quality standards.

J. Field Performance and Customer Complaints Control--Active liaison is maintained with the Field Service Engineers to take prompt corrective action so as to minimize production loss and maintain a high degree of customer satisfaction.

10.44 Special Process Studies. The Quality Control Department prepares a daily summary of high scrap and high rework items for distribution throughout the plant. This summary identifies the part or assembly, the department concerned, the number of defectives, and the major reason for rejection. IBM tabulating equipment is employed to enable preparation and distribution of this summary by noon of the day following the completion of inspection.

The Quality Control Department prepares a weekly summary of high scrap items showing the part or assembly, the quantity defective, the department responsible, the value of the defective items, and the reason for scrapping.

The department keeps up to date on statistical quality control methods and applies them in the inspection routines where they are deemed applicable. The use of statistical methods for machine and process control, such as frequency distributions and control charts is limited. This limited use is based on the difficulty encountered in applying these techniques to a job-lot production situation.

Technical investigations are conducted to determine the cause of recurrent high scrap or high rework product.

A department-level conference is conducted every month to consider serious quality problems that result in high scrap or rework. The agenda for this conference is prepared by the Quality Control Department.

A training program is currently being prepared.

Standards of quality for visual inspection are generally specified by samples, photographs, etc. Where necessary, the establishment of these standards is co-

ordinated with other departments.

An active program is maintained to satisfy the quality control requirements of governmental agencies and private industry customers.

10.5 Inspection Methods and Procedures. A variety of inspection methods and procedures are employed at Scintilla to implement the quality control functions described in the preceding section. A description of these procedures will complete our presentation of the quality control system in use.

10.51 Bench Inspection. As a general practice, all parts are bench inspected before they are allowed to enter the storerooms. All assemblies and sub-assemblies are bench inspected and tested as necessary before shipment. Bench inspection is made on the completed part or assembly. In addition, bench inspection is employed in-process in those cases where subsequent operations will make inspection for a particular item impossible or difficult during the final inspection, as for example in dimensional inspection prior to plating.

Scrap and rework is reported on an IBM ticket for tabulation and analysis by quality control. Scrap is then tagged and routed to the Materials Review Crib. Rework is tagged and routed to the applicable manufacturing department.

Sampling procedures are in general use based on the Dodge-Romig tables. However, as a matter of policy, visual inspection is 100%.

The bench inspection is conducted in accordance with predetermined routines and a written record is kept.

Bench inspection areas are scattered throughout the plant. Below is a listing of the general layout of bench inspection stations:

a. In-process bench inspection stations are generally located near the last operating station prior to the inspection.

b. Final inspection of small parts and purchased parts is centralized in an area near the parts storeroom.

c. Final inspection of plug-in-connector parts is centralized in an area near the plug-in-connector storeroom.

d. Final inspection of diesel parts is performed in the manufacturing area.

e. Final inspection of ceramics is performed in the ceramics manufacturing area.

f. Final inspection of large parts is performed in the manufacturing department areas.

g. Final inspection of assemblies is performed on the floor at the end of the assembly operations.

h. A bond room inspection of spare parts and plug-in-connectors is performed just prior to shipment in a fenced-off area integral with the stock "S" storeroom and the packing and shipping area.

10.52 Floor Inspection. A patrol inspection is conducted throughout the plant for all machine, bench, and process operations with the exception of the tool room, Engineering Experimental, the Molding Department, and the Ceramics Department.

The floor inspectors verify that the operator obtains necessary prints, gages, and layouts.

They are responsible for determining that the correct material for the job is being used by checking against the blueprint, color code, and the layout.

The floor inspector checks first pieces for all operators in the area assigned and subsequently spot checks random samples as time permits.

The floor inspector secures corrective action where necessary and has authority to initiate action to stop

the operation.

He is responsible for punching off piecework tickets for acceptable work only including verification of the quantity produced.

He is directed to tag and identify all scrap and rework. Rework is returned to the operator. Scrap is tagged, reported on a scrap ticket, and routed to the Material Review Crib.

The floor inspector maintains control charts where applicable. At the present time, control charts are used on only one group of machines used to manufacture plug-in-connector pins.

10.53 Crib Inspection. There are two areas on the manufacturing floor where a crib inspection of each operator's (or each group's) output is made in place of the customary floor inspection.

10.54 Performance Tests. Performance tests are performed in the manufacturing departments in accordance with predetermined routines and specifications.

10.55 Gage and Tool Inspection. All gages and those tools that establish dimensions which cannot subsequently be gauged are inspected to applicable drawings and specifications.

10.56 Layout Inspection. Samples from all dies, molds, and pattern equipment are checked by layout inspectors. Rechecks are made as necessary.

10.57 Salvage Inspection. All material routed to the Material Review crib is reviewed by the salvage inspectors and either disapproved of as scrap or presented to the Materials Review Board. Salvage inspectors also inspect or screen material as directed by the Materials Review Board.

10.58 Raw Material Inspection. All incoming materials are checked for proper vendor certification and government in-

spection where required. Laboratory analysis is made of samples of raw stock.

10.59 Check Inspection. At the present time a check inspection is conducted only of the inspectors in the diesel area.

10.510 Special Processes Inspection. The following special tests and inspections are conducted as applicable and as required:

a. Magnetic Particle Inspection.
b. Fluorescent Penetrant Inspection.
c. Hardness Testing.
d. X-ray Inspection.
e. Plating Thickness Inspection.

10.6 Discussion and Analysis.

10.61 General. As shown in the preceding sections, Scintilla has a well-organized, effective Quality Control Department. This is verified by the "Approved" rating awarded to the department by the United States Air Force.

There are, however, two significant areas that at least warrant investigation looking toward possible improvement.

The first area of investigation is predicated on the present scrap and rework rate. Quality Control Department data indicates that an average of about 7% of product is scrap and another 7% requires rework. It must be emphasized that these are generalized and approximate figures. Nevertheless, the fact that on the average about 14% of an operator's product is below standard, this amounting to over one hour of work per day per man, indicates that there is room for improvement.

The second area of investigation is based on the size (about 470) of the inspection section, and the ratio of between 4 and 5 production workers per inspector. Certainly these statistics in themselves are not conclusive evidence of inefficiency. They do, however, suggest that studies

looking toward improved economy in the inspection function would be desirable.

10.62 Reduction of Scrap and Rework. With the exception of a few processes such as die casting that have an inherently high scrap rate, the operations at Scintilla could be performed with considerably less scrap and rework. We may, therefore, conclude that one or more of the four tasks of Quality Control that we have referred to is not being carried out at an optimum level of performance.

New-design control is generally effective. Discrepancies do arise that might be worked out at an earlier date if an effective procedure were established between the Quality Control and Engineering Departments that would serve to resolve difficulties prior to release of prints and specifications. However, in general, the quality standards established by the Engineering Department are satisfactory and within the capabilities of the Manufacturing Department.

Incoming-material control is maintained effectively and, as nearly as could be determined, gives rise to no significant production difficulties in maintenance of product quality.

Thus our conclusion must be that the major share of bad product is a result of below optimum product control. To put it in a more direct way, the Manufacturing Department is not working at an optimum level of quality. This might be due to improper machine and tool maintenance or to poor operator performance. The scope of this study did not permit investigation into all of the possible causes. We will, however, propose the following suggested areas for further study:

a. Is equipment and tool maintenance adequate?

b. Are operating personnel adequately trained ?

c. Is the system of incentive payment such as to encourage the operator to produce at high volume without regard to quality?

d. Are effective quality checks made on the operators during the production run in time to avoid production of a large quantity of bad product?

e. Is the production foreman exercising his responsibility to obtain optimum quality production?

f. Are performance records of machines and processes in the form of control charts maintained to the maximum extent possible?

Although, as has been stated, our study could not cover all of these points, we are able to make a number of important observations.

All of the rework and very nearly all of the scrap is reported by bench inspectors. This means that, whatever salutory effect the floor inspectors might have, we must conclude that they are not effective in insuring quality production on the floor.

Associated with this evidence that the floor inspectors are not effective is the observation made by many of the inspection supervisors that production foremen are overly burdened with problems of scheduling and administration -- that they do not have the time to supervise the performance of operators. A further indication that this may be true is found in the fact that the floor inspectors have been directed to ascertain that operators procure necessary layouts, prints, and gages, and that the correct material is used. These are clearly functions that should be performed by the production foremen.

The present method of floor inspection is not serving its designed purpose, and is very likely encouraging a shifting of the production foremen's responsibilities for quality performance to the floor inspector.

There are two possible solutions to this problem. Either a tight crib-type or patrol inspection should be instituted, accompanied by a corresponding reduction in final inspection requirements, or floor inspection should be eliminated and responsibility for control of operator performance given completely to the Manufacturing Department, subject to the assistance of Quality Control Engineers.

Most authorities in the field of quality control feel that some sort of a floor inspection is necessary, as, for example, Juran (102)(pp. 119-124). The two areas at Scintilla where a tight crib-type inspection is performed

have functioned successfully. Final decision must, of course, be based on a thorough investigation of the economics of the situation and upon a determination as to whether or not the Manufacturing Department could enter into a successful program to control operator performance.

Use of an incentive system further complicates this problem. A quality bonus for production foremen might be advisable.

Wider use of control charts would contribute to a solution. Use of simple control charts based on attributes is feasible in job-lot production. The control chart provides a record of machine and operator performance that will quickly indicate trouble, and, because it forces the operator or inspector to maintain a written record of inspections, the required inspections are more likely to be made. For example, if the floor inspectors at Scintilla were now required to post percent defectives on a control chart at each operator's station based on a prescribed sampling procedure, far better results would be obtained in controlling quality at the operator level.

Special process studies are generally adequate. However, as we have noted, the quality control section is heavily burdened with routine duties. The addition of a section in the Quality Control Department headed by a well-qualified Quality Control Engineer who would be free to conduct independent investigations as conditions require would alleviate this condition. The problems discussed above would be fertile soil for such a group.

10.63 Economy in Inspection. Could the size of the inspection force be reduced by more efficient utilization and improved performance? It has been pointed out that the present system of floor inspection should either be developed into an effective quality control function or eliminated since it is not now serving to adequately control the level of scrap and rework.

Bench inspection is mandatory at Scintilla to meet government requirements and, in general to assure customer satisfaction. In some cases it is centralized, and in other cases it is performed in the manufacturing departments. No methods engineering is performed and engineered standards are not employed. Visual inspection

is generally a 100% sorting operation. These three conditions point the way to possible improvement in the economy of inspection at Scintilla.

10.631 Layout of Inspection Areas. A large portion of the bench inspection of manufactured and purchased parts is presently centralized. All final inspection of parts should be centralized at an inspection area integral with the parts storerooms. This would insure that all parts enter the inspection area prior to acceptance in the storeroom, eliminate paperwork in routing parts from final inspection to the storerooms, reduce and simplify material handling, and facilitate supervision of the inspectors.

The present method of final inspection of assemblies at the end of the assembly operations should be continued.

10.632 Methods and Standards for Inspection. Scant use is made in the inspection operations of basic work methods principles such as work-place layout, "two-at-a-time" operation, drop-delivery, etc. There is no Methods Engineering group in or working for the Quality Control Department.

No control data is available as to operator performance. Clearly, standards of performance should be established and compared against actual performance of the inspectors. It is costly to overlook this well-established technique of management for a group of almost 500 employees. It may be granted that setting standards and developing control data for inspection in a job-lot plant is difficult. However, it is presently being done for the manufacturing operations. If it is successful in that area, it could be applied with equal success to inspection.

10.633 Sampling vs. 100% Inspection. Although Scintilla acknowledges the economy of sampling inspection, there is an apparent attitude that sampling is not sufficiently accurate in visual inspection due to the random nature of most "visual" defects. In actuality, a random distribution of defects is required if sampling is to be accurate within the confidence levels of a designed plan. In cases where the distribution of defects is not random throughout the lot, as in the instance of progressive tool wear during the production of a lot, the sample pieces must be selected in

accordance with a random pattern. Basically the sample must, on the average, be representative of the lot. This requirement is insured if defects in the lot are randomly distributed as is the case here. Visual inspection should be performed on a sampling basis.

It might be noted in passing, that use of sampling plans requiring an average outgoing quality level of one percent or less when the product quality is 14% defective will not result in appreciable economy since most of the lots will have to be screened 100% anyway. The answer here, as has been previously emphasized, is to improve the quality performance of the Manufacturing Department. Only if this is done, will sampling procedures actually yield the expected economy of inspection.

10.7 Recommendations. It is recommended that Scintilla consider the feasibility of the following proposals:

1. That a Quality Engineering Section be added to the quality control organization.

2. That a Methods Engineering Section be either established in or, at least, function in the Inspection Section of the Quality Control Department.

3. That standards of performance for bench inspectors be established and a procedure set up for reporting comparison of actual versus standard performance.

4. That the Manufacturing Department foremen be held rigidly and primarily responsible for scrap and rework.

5. That floor inspection be made effective in its present form or by adoption of a crib-type in-process inspection procedure; or that it be completely eliminated.

6. That co-ordination of quality problems with the Engineering Department be effected prior to the release of prints and specifications to production as is now done in the case of engineering changes.

7. That final inspection of all parts be centralized in an integrated storeroom-inspection area.

8. That sampling inspection be employed wherever feasible including visual inspection.

9. That more extensive use be made of control charts.

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